"A STUDY VALIDATING STOP BANG QUESTIONNAIRE AS A SCREENING TOOL FOR OBSTRUCTIVE SLEEP APNEA IN PRE- OPERATIVE PATIENTS"

Dissertation submitted in partial fulfillment

of the requirements

for award of the degree

M.D. (Anesthesiology)

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MAY 2019.

CERTIFICATE

This is to certify that this dissertation entitled: **"A STUDY VALIDATING STOP BANG QUESTIONNAIRE AS A SCREENING TOOL FOR OBSTRUCTIVE SLEEP APNEA IN PRE-OPERATIVE PATIENTS"** Submitted by **Dr. PRINCE J** in partial fulfillment for the award of the degree Doctor of Medicine in Anesthesiology by **The Tamil Nadu Dr.M.G.R. Medical University, Chennai** is a bonafide work done by him at **KILPAUK MEDICAL COLLEGE, CHENNAI** during the academic year 2017-2019.

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CERTIFICATE-II

This is to certify that this dissertation entitled**: "A STUDY VALIDATING STOP BANG QUESTIONNAIRE AS A SCREENING TOOL FOR OBSTRUCTIVE SLEEP APNEA IN PRE –OPERATIVE PATIENTS"** of the candidate Dr.PRINCE J Postgraduate in Anesthesiology with Registration number 201720153 for the award of M.D ANESTHESIOLOGY in the Branch X . I personally verified the urkund.com website for the purpose of plagiarism check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows 5% of plagiarism in the dissertation

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DECLARATION

I, **Dr.PRINCE J,** solemnly declare that this dissertation, entitled:**"A STUDY VALIDATING STOP BANG QUESTIONNAIRE AS A SCREENING TOOL FOR OBSTRUCTIVE SLEEP APNEA IN PRE-OPERATIVE PATIENTS"** has been prepared by me, under the expert guidance and supervision of **Prof Dr.S.KRISHNAKUMAR,M.D.,** Professor, Department of Anesthesiology, Kilpauk Medical College and Hospital, Chennai and submitted in partial fulfillment of the regulations for the award of the degree **M.D,(Anesthesiology)** by **The Tamil Nadu Dr. M.G.R. Medical University** and the examination to be held in April 2019.

This study was conducted at Kilpauk Medical College Hospital, Chennai. I have not submitted this dissertation previously to any university for the award of any degree or diploma.

(Dr. PRINCE J)

Place: Chennai

Date:

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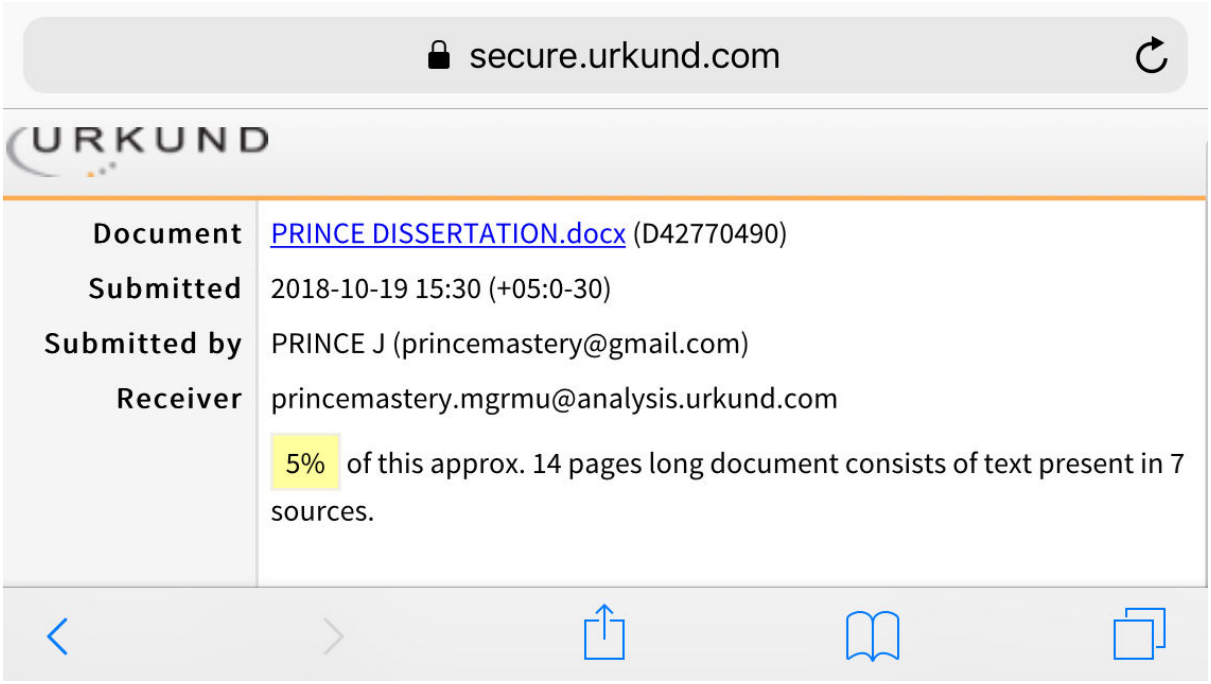
CONTENTS

LIST OF ABBREVIATIONS

ASA	American Society of Anesthesiologists
OSA	Obstructive Sleep Apnea
OHS	Obesity Hypoventilation Syndrome
CPAP	Continue Positive Airway Pressure
PSG	Polysomnography
BP	Blood Pressure
Kg	Kilogram
m^2	Metre square
cm	Centimetre
Pcrit	Pharyngeal Closing Pressure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INTRODUCTION

Obstructive sleep apnea is the most prevalent of sleep disordered breathing. Obstructive sleep apnea affects 24% of men, 9% of women in the general population. An estimated 82% of men 92% of women with moderate to severe obstructive sleep apnea have not been diagnosed.

In OSA repeated episodes of partial and complete collapse cause a reduction or total cessation of airflow during sleep resulting in oxygen desaturation and arousals from sleep. OSA leads to excessive daytime sleepiness, unrefreshing sleep, poor concentration and fatigue.

OSA is a serious condition that diminishes quality of life and is also associated with many co-morbidities. Patients with OSA will have increased incidence of coronary artery disease, systemic hypertension, congestive cardiac failure, cerebrovascular disease, gastroesophageal reflux disease. The average life span of a patient with untreated OSA is reduced.

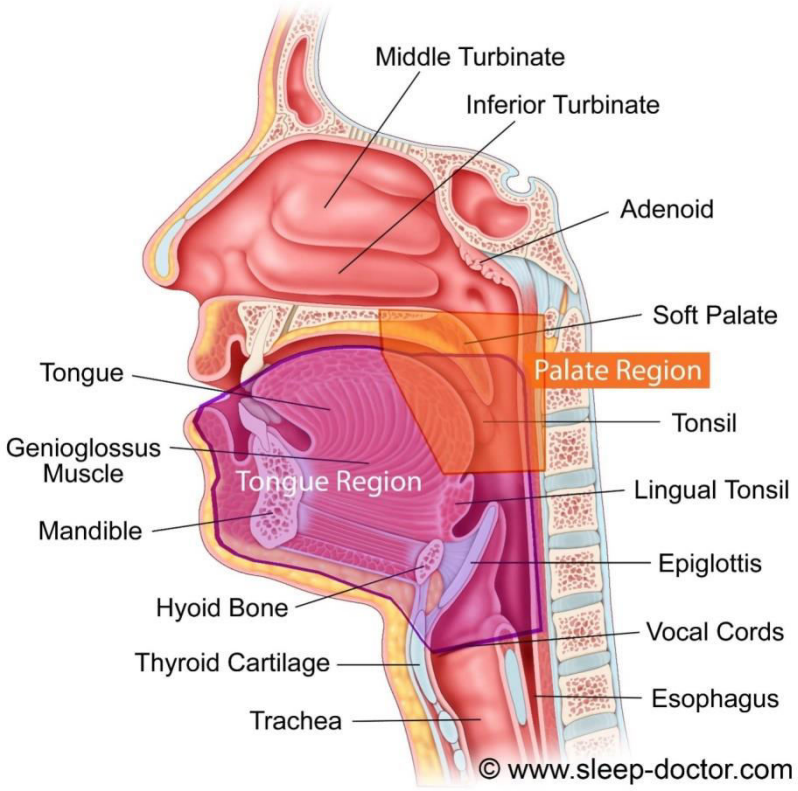
AIM OF STUDY

To test the performance of STOP-BANG QUESTIONNAIRE for the diagnosis of Obstructive sleep apnea in preoperative patients

OBJECTIVE OF THE STUDY:

To validate The STOPBANG QUESTIONNAIRE by using POLYSOMNOGRAPHY as a gold standard test

ANATOMY OF AIRWAY:



Upper airway is the common pathway for Gastrointestinal tract, Respiratory system and Phonatory system.

Usually it is divided into three parts

1. Nasopharynx.
2. Oropharynx.
3. Hypopharynx.

NASOPHARYNX:

BOUNDARIES:

Superiorly	-	posterior margin of nasal turbinate
Inferiorly	-	soft palate
Contents	-	posterior wall contains adenoids in children

Adenoid inflammation leads to partial obstruction to upper airway.

SOFT PALATE

It is a vertical flap like structure

BOUNDARIES

Superiorly	-	Posterior edge of hard palate
Inferiorly	-	Uvula

INNERVATION:

All the muscles of soft palate get innervation from Pharyngeal branch of Vagus nerve except tensor veli palatini which is innervated by medial pterygoid nerve.

Any elevation or swelling in the posterior portion of the soft palate towards the posterior pharyngeal wall causes enlargement of oral cavity during deglutition and thereby produces narrowing of Nasopharynx.

OROPHARYNX:

Oropharynx extends from soft palate to epiglottis.

BOUNDARIES:

Anteriorly by posterior part of tongue and soft palate

Posteriorly by constrictors of Pharynx

Laterally by Extrinsic muscles of the Tongue, muscles of soft palate, larynx and also by pharyngeal constrictors.

Oropharynx is the most common site of airway collapse in

Obstructive sleep apnea, which usually occurs during REM sleep.

RETROPALATAL AREA:

It contains

1. Palatine tonsil.
2. Parapharyngeal pad of fat.

TONGUE:

It consists of Extrinsic and Intrinsic muscles.

Extrinsic muscles are

1. Genioglossus.
2. Hyoglossus.
3. Palatoglossus.
4. Styloglossus.

Intrinsic muscles are:

1. Superior longitudinal
2. Inferior longitudinal
3. Transverse
4. Vertical

INNERVATION:

SENSORY SUPPLY:

Anterior 2/3 of tongue	-	Chorda tympani branch of facial Nerve.
Posterior 1/3 of tongue	-	Glossopharyngeal nerve

MOTOR INNERVATION:

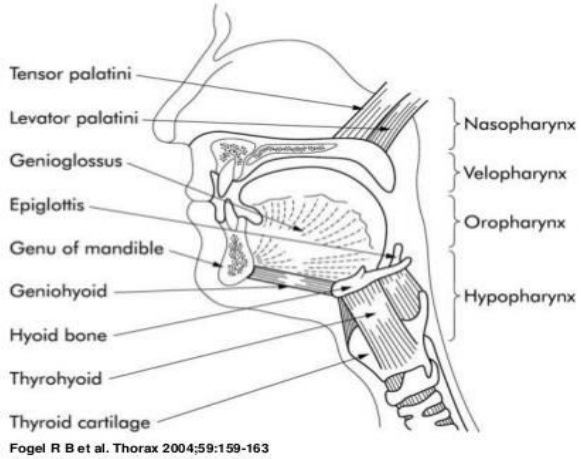
All extrinsic muscles of tongue are supplied by Hypoglossal nerve except palatoglossus which is innervated by vagus nerve.

The size of the tongue is an important risk factor for OSA. An increase in size of type II muscle fibres is seen in obstructive sleep apnea patients compared to normal individuals.

Hypoglossal nerve is the main component in the motor control of upper airway dilatation. The muscle fibres in the posterior part of tongue are fatigue resistant which maintains the forward tongue position and preventing its collapse into the retroglossal area.

Patients with OSA have minimum smaller airway area in the retropalatal region particularly in lateral dimension. The volume of tongue and lateral walls independently increase the risk of OSA.

Anatomical representation of the upper airway and the important muscles controlling airway patency.



Fogel R B et al. Thorax 2004;59:159-163

Retropalatal airway closure:

Patients will have higher percentage of Parapharyngeal pad of fat and palatal pad of fat

Retroglossal airway closure:

Patients will have increased volume of tongue and parapharyngeal pad of fat

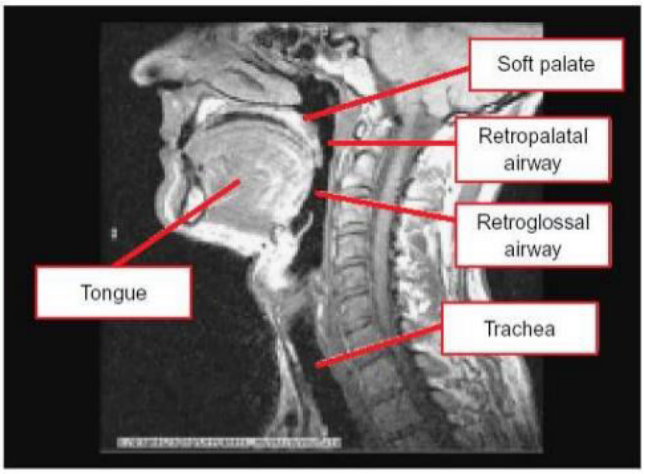


Figure 6 Magnetic resonance image of a normal subject. A mid-sagittal section of a normal individual illustrating the relevant anatomy. Collapse in obstructive sleep apnoea patients tends to occur behind the palate and/or tongue (retropalatal/retroglossal).

HYPOPHARYNX:

It extends from superior border of epiglottis to the inferior border of cricoid cartilage.

BOUNDARIES:

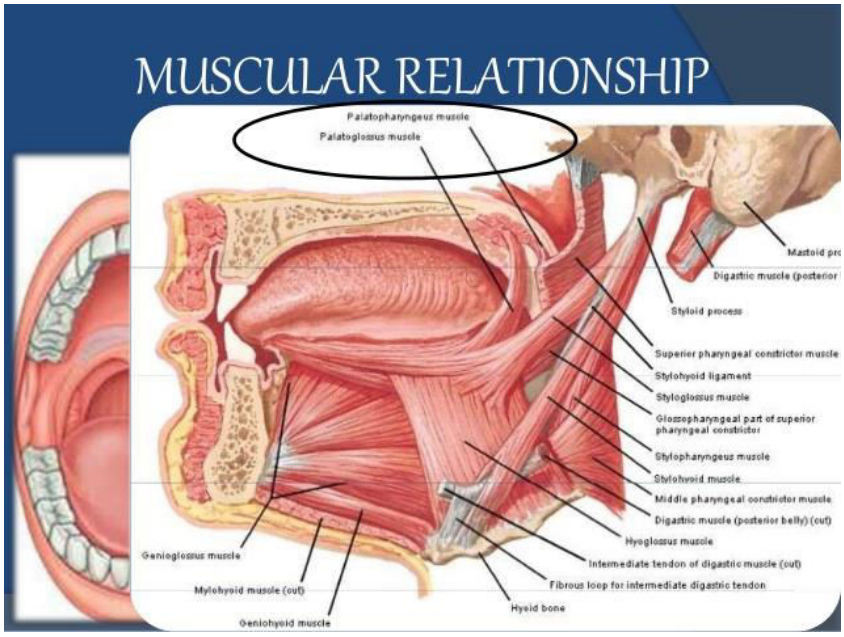
Anteriorly by base of tongue and epiglottis.

Postero-laterally by inferior pharyngeal constrictor.

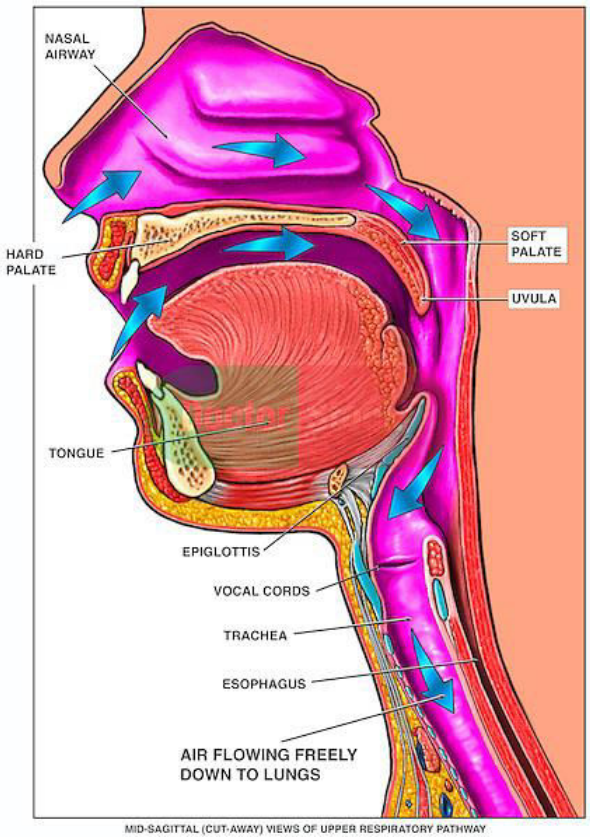
Hypopharynx consists of lingual tonsil.

Lingual tonsil hypertrophy plays an important role in OSA in children.

Epiglottic prolapse during inspiration can cause OSA.



AIRFLOW DURING SLEEP



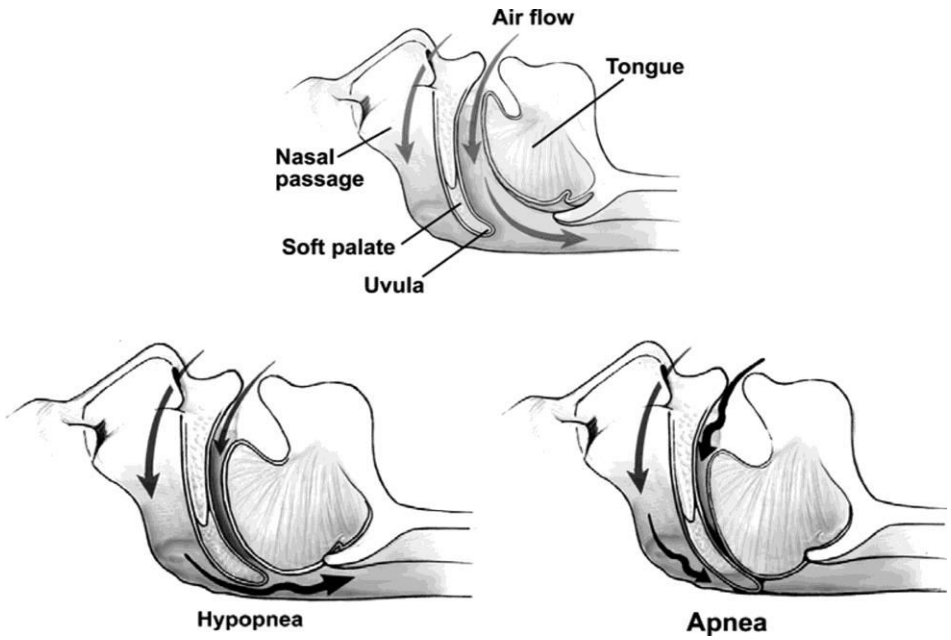
MID-SAGITTAL (CUT-AWAY) VIEWS OF UPPER RESPIRATORY PATHWAY

APNEA:

Repeated episodes of complete cessation of airflow for 10 seconds or longer.

HYPOPNEA:

It is a significant decrease in breathing without complete cessation of airflow ,it is defined as 30% decrease in airflow in conjunction with 4% oxygen desaturation .



PATHOPHYSIOLOGY OF OSA

The pathophysiology of OSA is multifactorial. The common mechanism which plays an important role in the development of OSA are

1. Upper airway collapsibility
2. Effects of lung volumes

3. Pharyngeal dilator tone
4. Arousal response in OSA
5. Ventilatory control stability
6. Pharyngeal neuropathy

Upper airway collapsibility:

Airway may collapse during sleep.

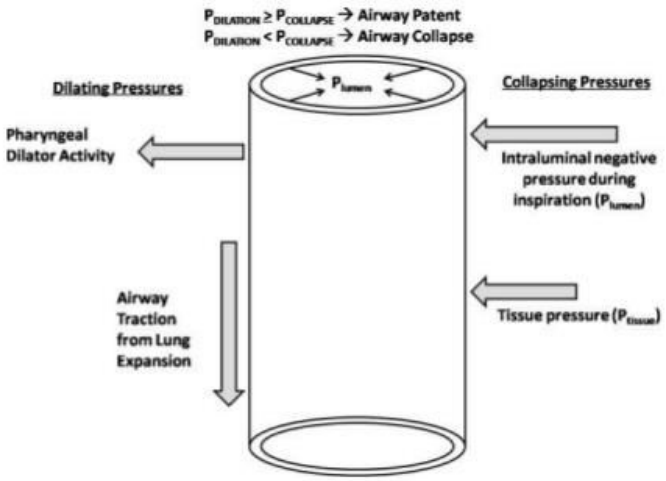
Airway collapse may due to

Changes in transmural pressure, either decreased

Intra-luminal pressure or increased external tissue pressure.

Decreased longitudinal tension on the pharynx.

Factors influencing pharyngeal collapsibility.



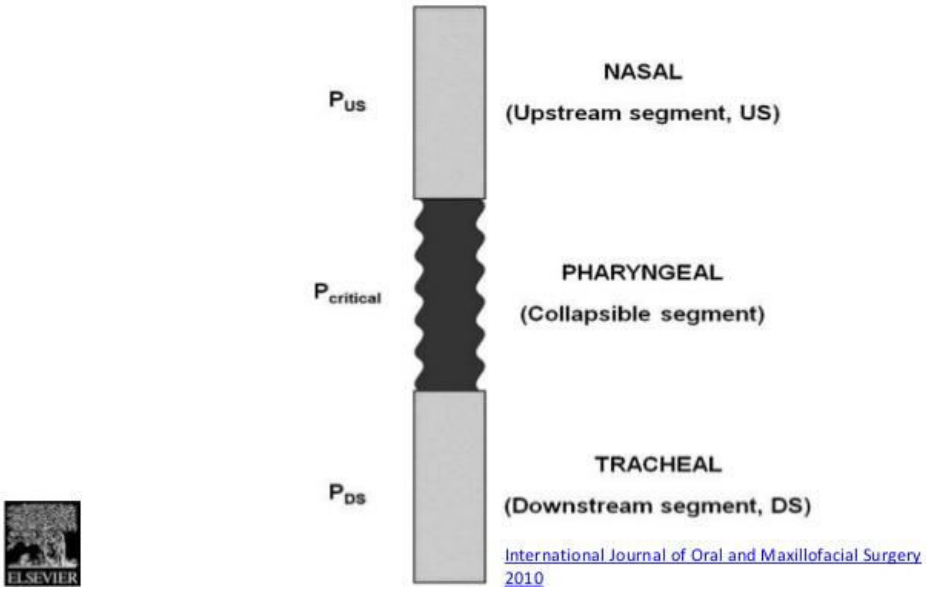
International Journal of Oral and Maxillofacial Surgery 2010; 39: 1149-1159

Patients with OSA have different airway compared to normal airway because of thicker lateral pharyngeal walls with anterior-posterior elliptical configuration. Airway area is also small in obstructive sleep apnea patients.

The threshold pressure sufficient to maintain patency of the upper airway is called the pharyngeal closing pressure (Pcrit).

Pcrit has been shown to correlate with severity of OSA. Reduction in weight reduces Pcrit there by maintaining patency of the airway.

Starling resistor model of the pharyngeal airway. The pressure required to keep the airway patent (Pcrit) is a function of the pressure upstream to the collapsing segment (PUS).



International Journal of Oral and Maxillofacial Surgery 2010

EFFECT OF LUNG VOLUMES:

Caudal traction and elongation of the airway reduces Pcrit through stiffening the airway and thereby decreasing the surrounding tissue pressure.

SUPINE POSITION

It causes reduction in lung volume in apneic patient which minimizes caudal traction on airway.

SEMI-RECUMBENT POSITION

It improves the caudal traction and thereby reducing Obstructive sleep apnea severity.

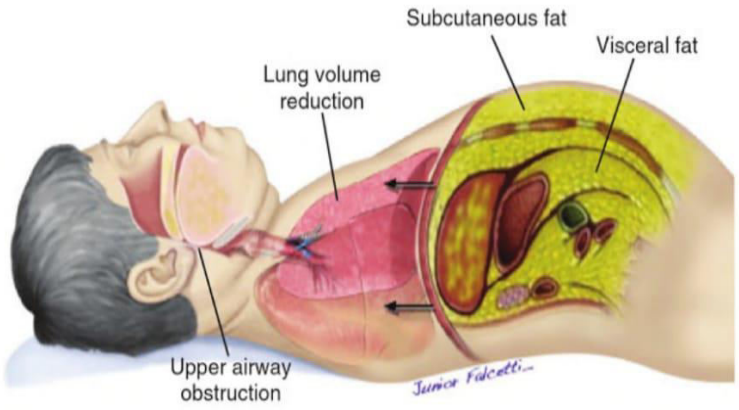


Figure 3-3 The contribution of obesity to obstructive sleep apnea. The illustration depicts the principle anatomic factors that place obese patients at significant risk for obstructive sleep apnea. (From Drager L, Togeiro SM, Polotsky VY, Lorenzi-Filho G. Obstructive sleep apnea: a cardiometabolic risk in obesity and the metabolic syndrome. *J Am Coll Cardiol* 2013;62[7]:569–576.)

UPPER AIRWAY DILATOR MUSCLE ACTIVITY:

Collapsing forces related to tissue pressure and intra-luminal negative pressure are balanced by pharyngeal dilator muscle activity. The genioglossus is the largest pharyngeal dilator. The tone of genioglossus muscle is reduced during sleep. Apneic patients are relying on a heightened genioglossus to support the airway, leading to airway instability.

The degree to which this occurs also depends on the sleep stage. Slow wave sleep has been associated with heightened genioglossus tone, which might be protective against OSA. During REM sleep reduction in tonic genioglossus activity occurs which potentiates further apneas.

AROUSAL RESPONSE IN OSA:

Most episodes of apneas are followed by arousals which are thought to be mediated via negative intra-thoracic pressure generation. OSA impairs the arousal threshold and apneic patients needed greater inspiratory efforts to trigger an arousal. Continuous positive airway pressure reduces the heightened arousal threshold in apneic patients.

VENTILATORY CONTROL STABILITY:

The feedback loop that controls the respiratory response to airway collapsibility and arousal can be conceptualized as Loop gain which refers to the magnitude of response related to intensity of input.

Obstructive sleep apneic patients have an elevated loop gain particularly those with severe OSA, which translates into an overshoot of Ventilatory response and arousal leading to disproportionately lower carbon dioxide.

PHARYNGEAL NEUROPATHY:

A selective impairment of the ability to detect mechanical stimuli of upper airway of the patients with OSA has been diagnosed using two point discrimination and vibratory test .Abnormal laryngeal sensation is detected using Air Pressure Pulses Endoscopy in OSA. Inflammation and denervation affect the oral mucosa and upper airway muscles in OSA.

AIRWAY OF OBSTRUCTIVE SLEEP APNEA

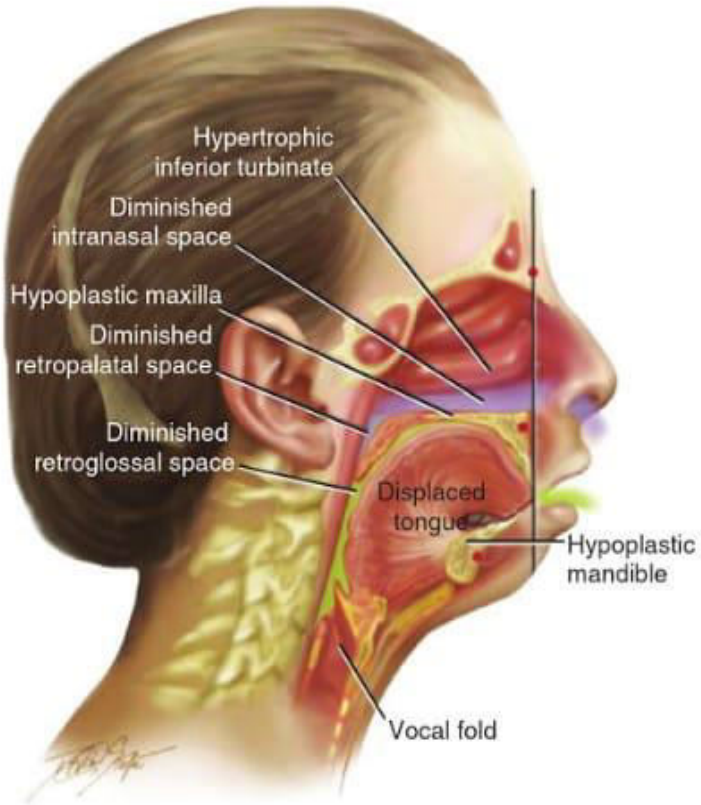


Figure 3-21 An illustration of a sagittal cross-sectional head and neck view from a 16-year-old patient with primary mandibular deficiency and overjet malocclusion predisposing to obstructive sleep apnea. (From Posnick JC. Obstructive sleep apnea: evaluation and treatment. In: Posnick JC, editor. *Orthognathic surgery: principles and practice*. Philadelphia: Elsevier; 2014. p. 992–1058.)

COMPLICATIONS OF OBSTRUCTIVE SLEEP APNEA:

1. Hypoxia with compensatory polycythemia.
2. Hypercapnia.
3. Pulmonary hypertension.
4. Right ventricular failure/cor-pulmonale.
5. Systemic hypertension.
6. Arrhythmia.
7. Sleep Fragmentation, Excessive daytime sleepiness.
8. Depression, Cognitive impairment.
9. Motor vehicle accidents – 7 fold increase.
10. Type 2 Diabetes mellitus, Metabolic syndrome.

CARDIOVASCULAR CONSEQUENCES:

Pathophysiology of OSA is the result of three immediate events

1. Apnea episodes.
2. Arousals.
3. Increased respiratory efforts.

APNEIC AND HYPOPNEIC EPISODES:

OSA induced Hypoxia and Re-oxygenation cycles activate REDOX sensitive genes, oxidative stress, inflammatory processes, sympathetic nervous system and coagulation cascade all of which can contribute to

endothelial dysfunction and ultimately leads to systemic hypertension, pulmonary hypertension, atherosclerosis, right and left ventricular systolic dysfunction, coronary artery disease congestive heart failure , Atrial fibrillation, stroke and sudden cardiac death .

AROUSAL EPISODES:

It leads to increased activation of sympathetic nervous system and decreased parasympathetic system activity, which results in increase in heart rate, left ventricular after load , myocardial oxygen consumption, dysrhythmias, myocardial toxicity and apoptosis arousal episodes leads to non-restorative sleep, chronic sleep deprivation which are also associated with increased sympathetic nervous system activity, inflammation and hyper metabolic state.

INCREASED RESPIRATORY EFFORTS:

It can result in large swings in negative intra-thoracic pressure which are transmitted to the heart, lungs and great vessels; this transmural pressure leads to multiple detrimental effects.

SYSTEMIC HYPERTENSION

Hypoxia and Hypercapnia leads to increased sympathetic tone resulting in hypertension. It is seen in 50% of the patients with

Obstructive sleep apnea. About 30% of the hypertensive individuals have obstructive sleep apnea

PULMONARY HYPERTENSION:

Apnea causes desaturation of oxygen, increased carbon dioxide accumulation, resulting in acidosis which leads to pulmonary hypertension due to pulmonary vasoconstriction. Chronic hypertension results in right ventricular hypertrophy causing right ventricular failure.

CARDIAC ARRHYTHMIA:

Apnea causes Nocturnal bradycardia followed by tachycardia on arousal.

Unexplained nocturnal deaths are also common in patients with obstructive sleep apnea. Patients with sleep apnea have 30% higher risk of Myocardial infarction than normal individuals.

NEUROLOGICAL CONSEQUENCES:

EEG changes

Slowing of EEG.

Decrease in deeper stages of sleep.

Compensatory increase in lighter stage of sleep

Psychomotor vigilance task testing demonstrates an increase in the number of lapses

OSA is associated with

Decrease in cognition and performance

Decrease in quality of Life

Mood disorder

Increased rate of motor vehicle collisions.

METABOLIC DERANGEMENT:

Insulin resistance

Glucose intolerance

Dyslipidemia

METABOLIC DISORDER:

Type 2 DM

Metabolic syndrome

Central obesity

Non-alcoholic steatohepatitis (NASH)

Polycystic ovarian syndrome (PCOS)

OSA is seen in 50% of the patient with NASH.

OSA is seen in 30-50% of the patients with PCOS.

OBESITY AND OSA:

Obesity, often an accompaniment to OSA, presents the anaesthesia provider's first set of challenges. Deposition of fat in the pharyngeal tissues exacerbates the underlying narrowness and collapsibility of the pharyngeal airway. Obese patients also accumulate more visceral fat, which appears to affect the severity of the OSA.

Symptom severity correlates with weight loss and gain. 10% gain in weight in patients with OSA led to a 32% increase in the number of apneas and hypopneas experienced per hour of sleep. A modest 10% decrease in weight led to a 26% improvement in the AHI. Weight loss results in a dose-dependent decrease in the severity of the syndrome.

Apart from upper airway narrowing, fat deposition in the chest and abdomen contributes to OSA. In morbidly obese patients, neck size is a better predictor of sleep apnea than other body anthropomorphic measures. Abdominal obesity may reduce lung volumes particularly in the supine posture and so reduce upper airway size. Lung volume directly influences upper airway size during respiration.

Thoracic inspiratory activity causes caudal traction on trachea, increasing cross-sectional area. This may be reduced in obese patients as impaired respiratory muscle force noted in these patients. Cephalad movement of the trachea, as would occur with a decrease in lung volume,

decreases upper airway size and increases pharyngeal resistance. Passive inflation of the lung producing an increase in end - expiratory lung volume increases the size of the retropalatal airway.

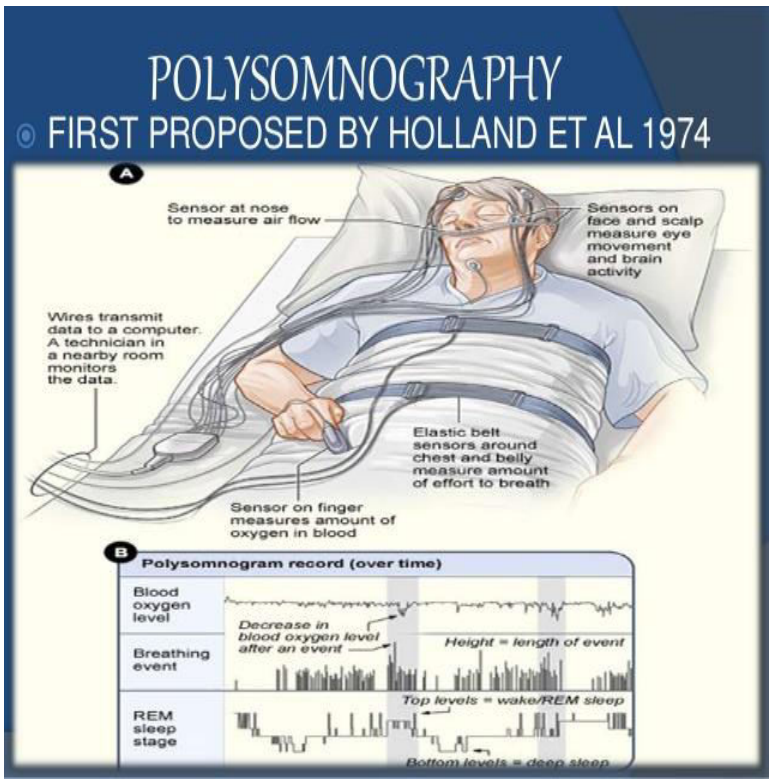
OSA and obesity also play a significant role in cardiovascular morbidity. Obesity increases the risk of hypertension, heart failure, stroke, and coronary heart disease . Another common co-morbid condition in patients with OSA is metabolic syndrome. This disorder is characterized by the clustering of concurrent metabolic conditions. Typically, the patient has central obesity, hypertension, diabetes, and dyslipidemia. Although a direct link has yet to be made between metabolic syndrome and OSA, about 60% of patients with OSA have metabolic syndrome In addition to managing the consequences of OSA and cardiovascular morbidity, the anaesthesia provider must also be cognizant of the end-organ damage that can result from metabolic syndrome.

The development of Obesity Hypoventilation Syndrome (OHS) is multifactorial, with the key elements a combination of obesity (increased upper airway loading and reduced lung volumes), OSA, poor chemoreceptor function (particularly defective arousal responses to hypoxia) and possibly alcohol consumption (reducing upper airway tone and arousal responses to asphyxia).

It is important to stress that awake hypercapnia can occur in obese patients in the absence of any smoking history or lung or muscle disease More recently, leptin has been implicated in sleep –disordered breathing in obese subjects. Leptin replacement resulted in an increase in minute ventilation (awake and asleep) and increased chemosensitivity to carbon dioxide during sleep. These changes were independent of food intake, weight and CO_2 production.

Patients with OSA have higher leptin levels than subjects with similar obesity without OSA. In human obesity, leptin "resistance" is common and leptin may act as a respiratory stimulant so that deficiency or resistance to the effects of leptin may promote OHS

POLYSOMNOGRAPHY:



Polysomnography is a type of sleep study. It is a multi parametric analysis used in the study of sleep. Polysomnography is a comprehensive recording of the biophysical changes that occur during sleep. Standard PSG consists of simultaneous recording of multiple physiologic parameters during a full night of sleep in a sleep laboratory with a sleep technologist in attendance. It should contain 6 or more hours of recording.

The recorded PSG study is divided into 30 second periods called epochs for scoring purposes. During scoring each individual epoch must be scored for sleep stage, and any respiratory events such as apnea or hypopnea with or without obstruction, cardiac or limb events and

associated arousal. Respiratory events are scored if they last 10 seconds or longer.

Sleep apnea testing can be done in several ways each with decrease in degree of complexity.

Level 1 testing is Polysomnography.

Level 2 testing is unattended PSG done at home.

Level 3 testing is home apnea testing in combination with active graph.

Level 4 testing uses one to two channels to monitor pulse oximetry and air flow.

Overnight home oximetry is an example of level 4 sleep apnea test.

The rules for performing and interpreting PSG are published in American Association of Sleep Medicine (AASM) Manual for scoring of sleep and associated events. The manual covers the performance and interpretation of Polysomnography studies and home sleep testing.

USES OF POLYSOMNOGRAPHY:

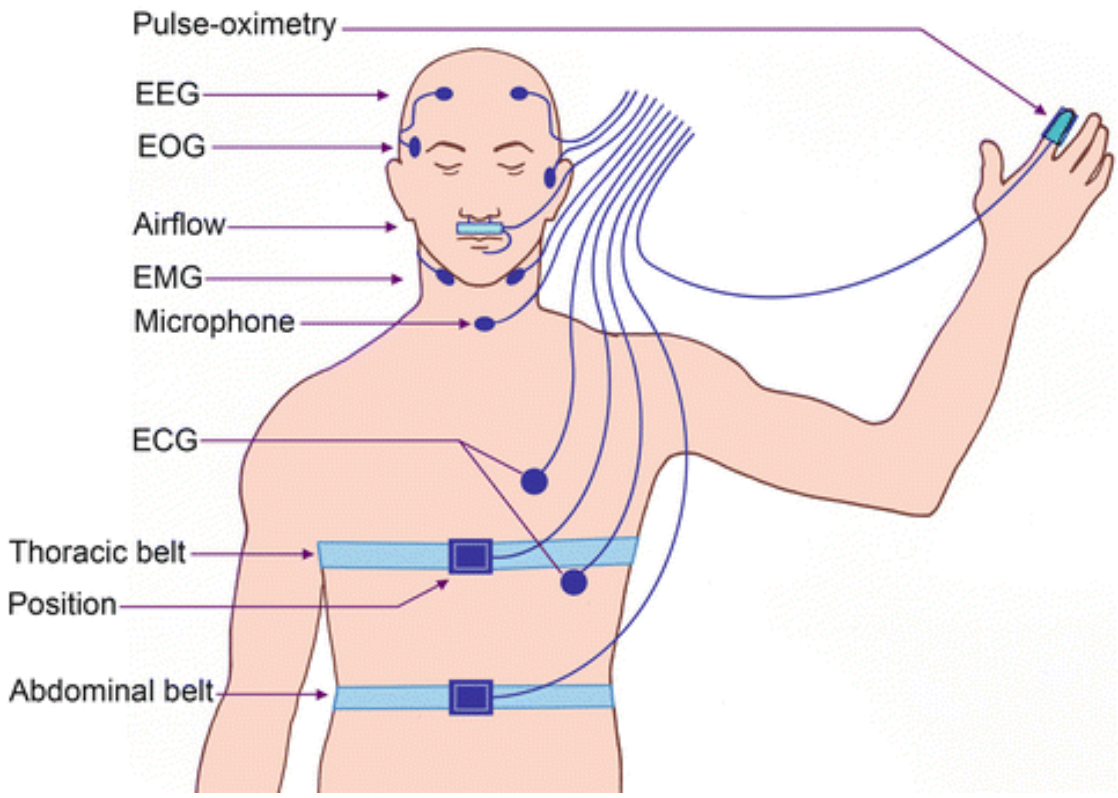
1. Used to differentiate central sleep apnea from obstructive sleep apnea.

2. To assess the severity of OSA.

3. To detect associated hypoventilation and hypoxia.

4. To titrate positive airway pressure therapy.

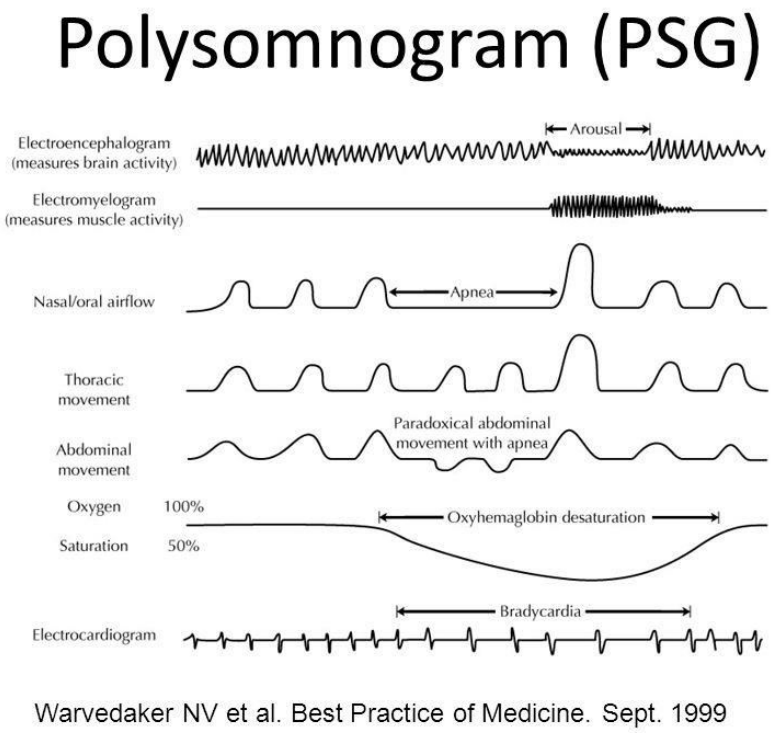
5. To perform follow up assessments of any implemented therapy for the Sleep related breathing disorder.



PHYSIOLOGICAL FUNCTION STUDIED DURING POLYSOMNOGRAPHY:

- Electroencephalogram to measure and evaluate sleep stages.
- Electrooculogram to measure eye movements.
- Chin electromyogram to measure muscle tone and the presence sleep without atonia.
- Limb Electromyogram to detect periodic limb movements and restless leg syndrome.
- Electrocardiogram to detect dysrhythmias.
- Upper airway sound recording to detect snoring.
- Nasal and oral airflow via air thermal sensor to detect apnea.

- Nasal airflow via pressure sensor to detect hypopnea and arousals.
- Thoraco-abdominal inductance plethysmography to detect respiratory effects.
- Pulse oximeter to detect oxygen saturation/ desaturation.
- Capnography to detect hypercarbia/hyperventilation.
- Body position sensor to note body position effects.
- Video recording or sleep technologist observation to detect parasomnia.



Warvedaker NV et al. Best Practice of Medicine. Sept. 1999

TYPES OF SLEEP STUDY

Overnight diagnostic sleep studies

1. This is the most common type of sleep study , where tiny sensors are used to measure the body's physiological process during sleep.
2. Diagnostic polysomnograms (PSGs) are used to diagnose snoring, obstructive sleep apnoea, periodic limb movement disorder, sleep-state misperception, and other less common sleep disorders; they can also be very helpful in investigating insomnia, narcolepsy, idiopathic hyper somnolence and restless limb syndromes.
3. Many of the standard sleep-laboratories use infra-red digital video technology to enable recording of abnormal limb movements, fits or seizures, and abnormal behaviours during sleep.

Daytime diagnostic studies

Daytime diagnostic sleep studies similar to overnight PSG can be performed in individuals who normally sleep during the day (such as shift-workers).

CPAP Titration studies

In patients whom CPAP treatment is recommended, a CPAP-titration study is used to determine what CPAP pressure is required to control snoring and obstructive respiratory events optimally. Tiny sensors

similar to those used during a diagnostic sleep study are also used during a CPAP-titration study.

BPAP (VPAP) and APAP Titration studies

They are similar to CPAP-titration studies; these studies involve the use of bi-level positive airway pressure (BPAP, also called variable Positive Airway Pressure - VPAP) or Automated Positive Airway Pressure (APAP) technology to treat OSA.

Multiple Sleep Latency Test (MSLT)

1. MSLT is a specialised daytime sleep-study used to investigate narcolepsy and hyper somnolence.
2. MSLTs are generally performed during the day, immediately following an overnight PSG.
3. The test involves 4 or 5 nap periods at 2-hourly intervals throughout the day.
4. Brain waves and eye movements are recorded to enable sleep-times and sleep- stages to be determined.

Maintenance of Wakefulness Test (MWT)

This test is used to assess a patient's ability to maintain wakefulness throughout the day. This test is helpful in assessing the efficacy of an individual's treatment for sleep-disorders and driving safety. MWTs are generally performed during the day, immediately following an overnight PSG.

It involves four, 40-minute test periods at 2-hourly intervals, throughout the day. Patients are required to stay awake throughout each test period (brain waves and eye movements are recorded to enable wakefulness and sleep-states to be determined).

Electroencephalograms

Many sleep laboratories uses full 28-channel EEGs in parallel with all overnight and daytime sleep-studies in patients with suspected epilepsy, nocturnal seizures, fits or 'funny turns'. EEG facilities include time-linked digital video recordings, so that convulsions or other abnormal movements during sleep.

RULES FOR SCORING RESPIRATORY EVENTS DURING POLYSOMNOGRAPHY IN ADULTS

RESPIRATORY EVENT	SCORING CRITERIA
Obstructive apnea	Apnea for >10 seconds with a > 90% airflow reduction despite respiratory effort.
Central apnea	Apnea for >10 seconds with a > 90% airflow reduction without respiratory effort.
Hypopnea	A > 30% reduction in airflow for > 10 10 seconds associated with a ≥ 3% decline in oxygen saturation or arousal.
Hypoventilation	A 10 minute period with Pco_2 > 55mmHg or a ≥ 10mm Hg increase in Pco_2 to ≥ 50 mmHg.
Periodic breathing	≥ 3consecutive cycles of cheyne-stokes breathing with cycle length ≥ 40 secs or ≥ 5episodes of Cheyne-stokes breathing in 2 hours.

The gold standard for diagnosis of obstructive sleep apnea is an overnight polysomnography.

But Polysomnography is

Time consuming

Labour-intensive and

Costly.

Polysomnography requires sleep medicine specialists. They may not be readily available in most of the hospitals and medical centers.

Therefore a simple and reliable method of identifying patients who are at high risk obstructive sleep apnea and triaging them for prompt diagnosis and treatment is clinically relevant.

POLYSOMNOGRAM OF PATIENT WITH CENTRAL SLEEP APNEA

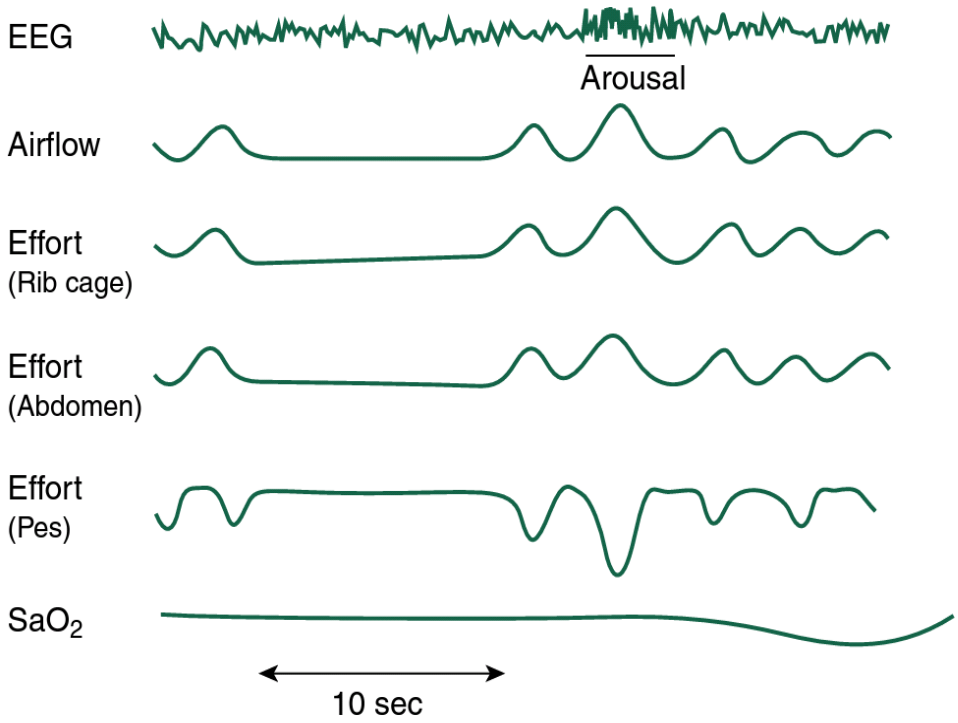


Figure 15-10 Polysomnogram representation of central sleep apnea. (From Wilkins RL, et al: *Clinical assessment in respiratory care*, ed 6, St Louis, 2010, Mosby.)

POLYSOMNOGRAM OF PATIENT WITH APNEA

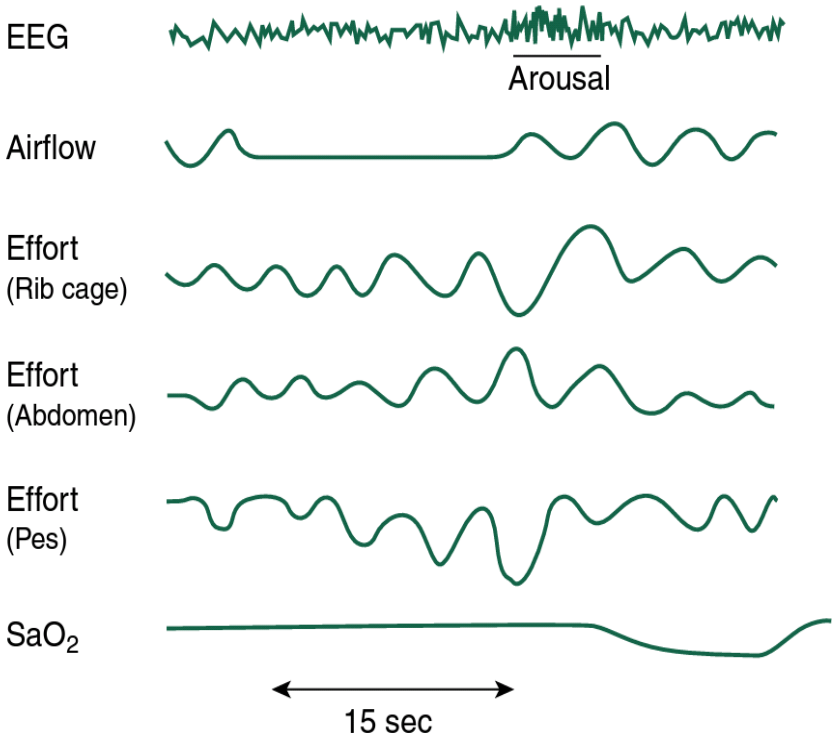


Figure 15-7 Polysomnogram representation of obstructive sleep apnea in the presence of apnea. (From Wilkins RL, et al: *Clinical assessment in respiratory care*, ed 6, St Louis, 2010, Mosby.)

POLYSOMNOGRAM OF PATIENT WITH HYPOPNEA

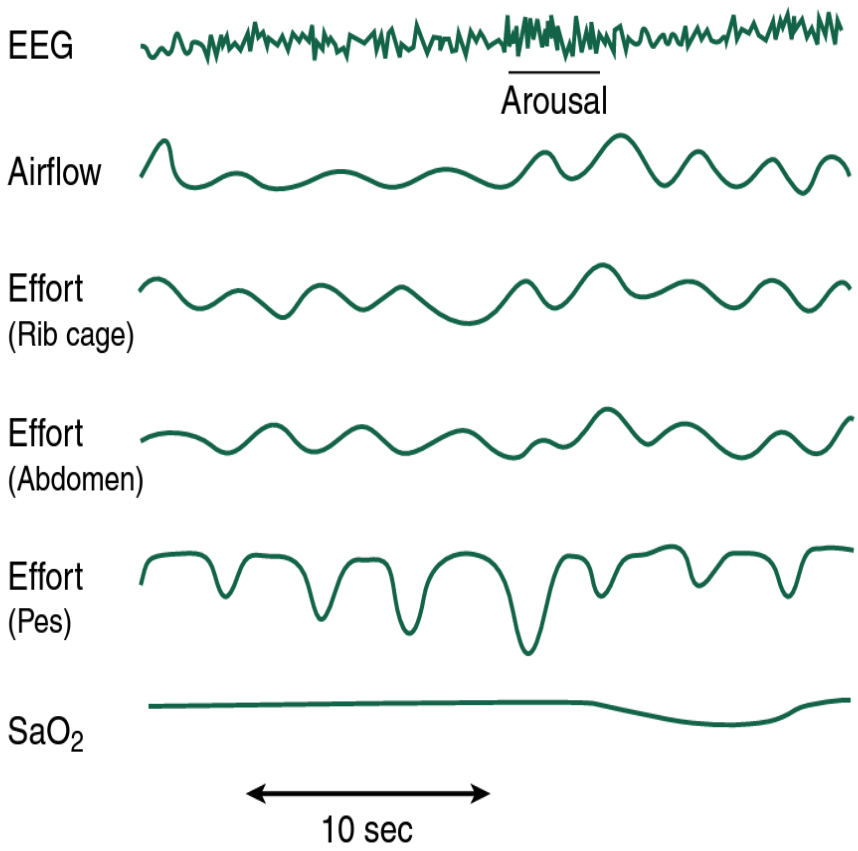


Figure 15-8 Polysomnogram representation of obstructive sleep apnea in the presence of hypopnea. (From Wilkins RL, et al: *Clinical assessment in respiratory care*, ed 6, St Louis, 2010, Mosby.)

POLYSOMNOGRAM REPRESENTING

RESPIRATORY EFFORT REALATED AROUSALS

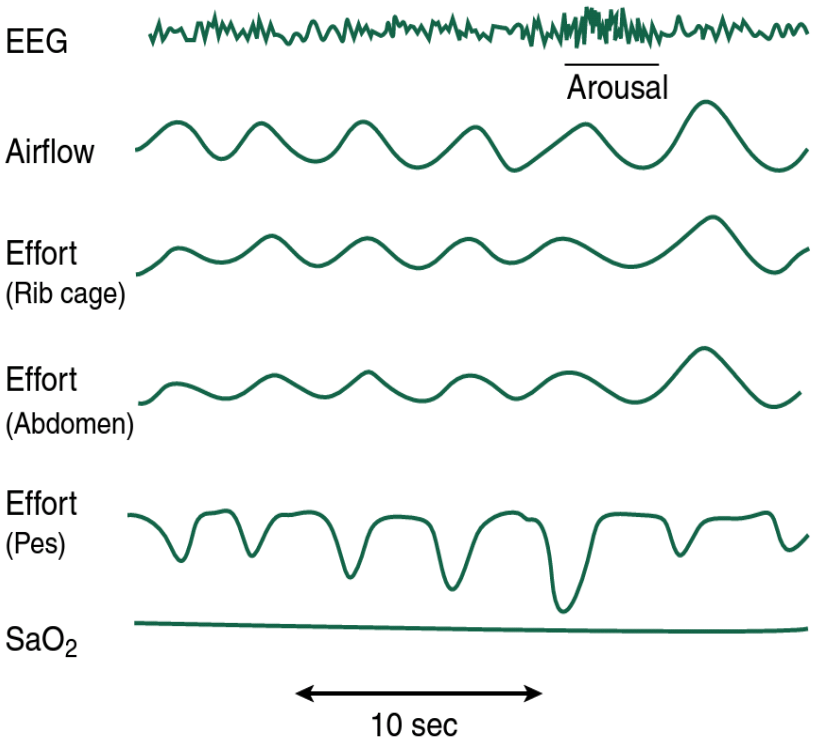


Figure 15-9 Polysomnogram representation of respiratory effort–related arousals. (From Wilkins RL, et al: *Clinical assessment in respiratory care,* ed 6, St Louis, 2010, Mosby.)

QUESTIONNAIRES:

Multiple tools in the form of questionnaires have been developed for screening populations for Obstructive sleep apnea.

The Epworth sleepiness scale:

- Used to assess excessive day time sleepiness

The Berlin Questionnaire describes three categories:

- Snoring
- Sleepiness
- Risk factors

The American association of sleep medicine developed 10 item questionnaires to detect classic symptoms of OSA and a 6 item check list to identify patients who are at high risk for OSA.

The American society of anesthesiologists created an OSA checklist with 3 categories

- Predisposing physical characteristics
- History of apparent airway obstruction during sleep
- Somnolence

Peri-operative sleep apnea prediction score:

Developed by Ramachandran et al. It is based on logistic regression analysis of surgical patient data it has nine elements:

- Age,
- Male gender,
- Obesity,
- Snoring,
- Type 2 diabetes mellitus,
- Hypertension,
- Thick neck,
- Mallampati class 3 or greater,
- Reduced Thyromental distance.

EPWORTH SLEEPINESS SCALE

Date _____

Name_____
_____

Date of Birth_____

How likely are you to doze off or fall asleep in the situations described below, in contrast to feeling just tired? This refers to your usual way of life in recent times.

Use the following scale to choose the **most appropriate number** for each situation:

0 - Would **never** doze
1 - **Slight** chance of dozing
2 - **Moderate** chance of dozing
3 - **High** chance of dozing

Situation
Chance of dozing (out of 3)

Sitting and reading

Watching TV

Sitting, inactive in a public place (eg. a theatre or a meeting)

As a passenger in a car for an hour without a break

Lying down to rest in the afternoon when circumstances permit

Sitting and talking to someone

Sitting quietly after a lunch without alcohol

Berlin Questionnaire

1. Complete the following:

Height: _____ Weight: _____

Age: ___Gender: ____M ____F

2. Do you snore?
_____ Yes
_____ No
_____ Don't know

If you snore:

3. Your snoring is…
_____ Slightly louder than breathing
_____ As loud as talking
_____ Louder than talking
_____ Very loud, can be heard in adjacent rooms

4.How often do you snore?
_____ Nearly every day
_____ 3-4 times a week
_____ 1-2 times a week
_____ 1-2 times a month
_____ never or nearly never

5.Has your snoring ever bothered other people?
_____ Yes
_____ No

6.Has anyone noticed that you quit breathing during your sleep?
_____ Nearly every day.
_____ 3-4 times a week
_____ 1-2 times a week
_____ 1-2 times a month
_____ never or nearly never

7.How often do you feel tired or fatigued after your sleep?
_____ Nearly every day
_____ 3-4 times a week
_____ 1-2 times a week
_____ 1-2 times a month
_____ never or nearly never

8.During your wake time, do you feel tired, fatigued, or not up to par?
_____ Nearly every day
_____ 3-4 times a week
_____ 1-2 times a week
_____ 1-2 times a month
_____ never or nearly never

9.Have you ever nodded off or fallen asleep while driving a vehicle?
_____ Yes
_____ No
_____ If yes, how often does it occur?
Nearly every day. _____
3-4 times a week _____
1-2 times a week _____
1-2 times a month _____
never or nearly never

10. Do you have high blood pressure?
_____ Yes
_____ No
_____ Don't know

BMI (Body mass index) =
_____

Scoring the Berlin Questionnaire

The questionnaire consists of 3 categories related to the risk of having sleep apnea. Patients can be classified into High Risk or Low Risk based on their responses to the individual items and their overall scores in the symptom categories.

Categories and Scoring:

Category 1: Items 2, 3, 4, 5, and 6;

Item 2: if '**Yes'**, assign **1 point**

Item 3: if either of the last two options is the response, assign **1 point**

Item 4: if either of the first two options is the response, assign **1 point**

Item 5: if **'Yes'** is the response, assign **1 point**

Item 6: if either of the first two options is the response, assign **2 points**

Add points. Category 1 is positive if the total score is 2 or more points.

Category 2: items 7, 8, and 9.

Item 7: if either of the first two options is the response, assign **1 point**

Item 8: if either of the first two options is the response, assign **1 point**

Item 9: if **'Yes'** is the response, assign **1 point**

Add points. Category 2 is positive if the total score is 2 or more points.

Category 3 is positive if the answer to item 10 is 'Yes' or if the BMI of the patient is greater than 30 kg/m2. (BMI is defined as weight (kg) divided by height (m) squared, i.e.., kg/m2).

High Risk: if there are 2 or more categories where the score is positive.

Low Risk: if there is only 1 or no categories where the score is positive.

Additional Question: item 9 should be noted

Name _____

Height _____ Weight _____

Age _____ Male / Female _____

STOP-BANG Sleep Apnea Questionnaire

STOP		
Do you **S**NORE loudly (louder than talking or loud enough to be heard through closed doors)?	Yes	No
Do you often feel **T**IRED, fatigued, or sleepy during daytime?	Yes	No
Has anyone **O**BSERVED you stop breathing during your sleep?	Yes	No
Do you have or are you being treated for high blood **P**RESSURE?	Yes	No
BANG		
BMI more than 35kg/m2?	Yes	No
AGE over 50 years old?	Yes	No
NECK circumference > 16 inches (40cm)?	Yes	No
GENDER: Male?	Yes	No

TOTAL SCORE

High risk of OSA : 5 - 8

Intermediate risk of OSA : 3 - 4

Low risk of OSA : 0 – 2

Each one parameter carries one point

STOP-BANG QUESTIONNAIRE:

The STOP-BANG Questionnaire was first developed in 2008 by Frances Chung. It is a simple easy to remember and self-reportable screening tool which includes four subjective and four demographic parameters:

S - SNORING

T - TIREDNESS

O - OBSERVED APNEA

P - PRESSURE (B.P)

B - BMI

A - AGE

N - NECK CIRCUMFERENCE

G - GENDER

The STOP-BANG Questionnaire was originally validated to screen OSA in surgical patients.

REVIEW OF LITERATURE:

Nagappa M, Liao P, Wong J, Auckley D,

Ramachandran SK, Memtsoudis S, et al.

Seventeen studies including 9,206 patients met criteria for the systematic-review. In the sleep clinic population, the sensitivity was 90%, 94% and 96% to detect any OSA (AHI ≥ 5), moderate to severe OSA (AHI ≥15), and severe OSA (AHI ≥30) respectively. The corresponding Negative Predictive Value was 46%, 75% and 90%. A similar trend was found in the surgical population. In the sleep clinic population, the probability of severe OSA with a STOP-Bang score of 3 was 25%. With a stepwise increase of the STOP-Bang score to 4, 5, 6 and 7/8, the probability rose proportionally to 35%, 45%, 55% and 75%, respectively. In the surgical population, the probability of severe OSA with a STOP-Bang score of 3 was 15%.With a stepwise increase of the STOP-Bang score to 4, 5, 6 and 7/8, the probability increased to 25%, 35%, 45% and 65%, respectively.

GRACE BOYNTON Et al

Among N=219 subjects (mean age 46.3 ± 13.9 [s.d.] years; 98 [44.8%] males) the sensitivity of the STOP-BANG measured for an Apnea/Hypopnea index (AHI, events per hour of sleep) >5, >15, and >30 was 82, 93, and 97% respectively. Corresponding negative predictive

values were 44, 87, and 96%. Specificities were comparatively low (48, 40, and 33%).The STOP-BANG measured and STOP-BANG self-reported scores showed essentially equivalent test characteristics against polysomnography.

F. Chung, R. Subramanyam, P. Liao1, E. Sasaki, C. Shapiro and Y. Sun

The median age of 746 patients was 60 yr, 49% males, BMI 30 kg/m^2 and neck circumference 39 cm. OSA was present in 68.4% with 29.9% mild, 20.5% moderate and 18.0% severe OSA. For a STOP-BANG score of 5, the odds ratio (OR) for moderate/severe and severe OSA was 4.8 and 10.4, respectively. For STOP-BANG 6, the Odd's Ratio for moderate/severe and severe OSA was 6.3 and 11.6, respectively. For STOP-BANG 7 and 8, the OR for moderate/severe and severe OSA was 6.9 and 14.9, respectively. The predicted probabilities for moderate/severe OSA increased from 0.36 to 0.60 as the STOP-BANG score increased from 3 to 7 and 8.

STUDY DESIGN:

A screening study

INCLUSION CRITERIA:

- Patients coming for preoperative assessment for elective surgeries.
- Adult patients.
- Both genders.
- ASA class 1 and 2.
- Patients who have given valid informed consent.

EXCLUSION CRITERIA:

- Patients not satisfying inclusion criteria.
- Impaired ability to communicate (e.g., confusion, poor hearing or language barrier).

MATERIALS AND METHODS

MATERIALS:

- Sphygmomanometer
- Stethoscope
- Weighing machine
- Height scale
- Inch tape

SOURCE OF DATA:

Patients coming for preoperative assessment clinics at Govt. Kilpauk Medical College Hospital, Chennai between February 2018 and July 2018 will be assessed for inclusion and exclusion criteria and will be included in the study after obtaining written informed consent.

SAMPLE SIZE: 98

Sample size was determined based on the study "Validation of STOP-BANG Questionnaire as a screening tool for OSA in surgical populations"

Study population 4200

Prevalence (p) 43%

Allowable margin error (d) 10%

Sample size (n) = $4*P*(1-P)/d^2$

= **98**

METHODOLOGY

Out of 25-30 new patients coming to preoperative assessment clinic, one participant will be selected by simple random sampling and the participant will be evaluated using STOPBANG Questionnaire containing four subjective and four demographic parameters and the patients are classified based on STOP-BANG score into

0 – 2 Low risk of sleep apnea

3 – 4 Intermediate risk of having sleep apnea

5 – 8 High risk of having sleep apnea

and the same participant will be subjected to Polysomnography and classified based on APNOEA HYPOPNEA INDEX (AHI) into

Normal - AHI <5

MILD - AHI 5-14

Moderate - AHI 15-29

Severe - AHI 30 and above

STATISTICAL ANALYSIS:

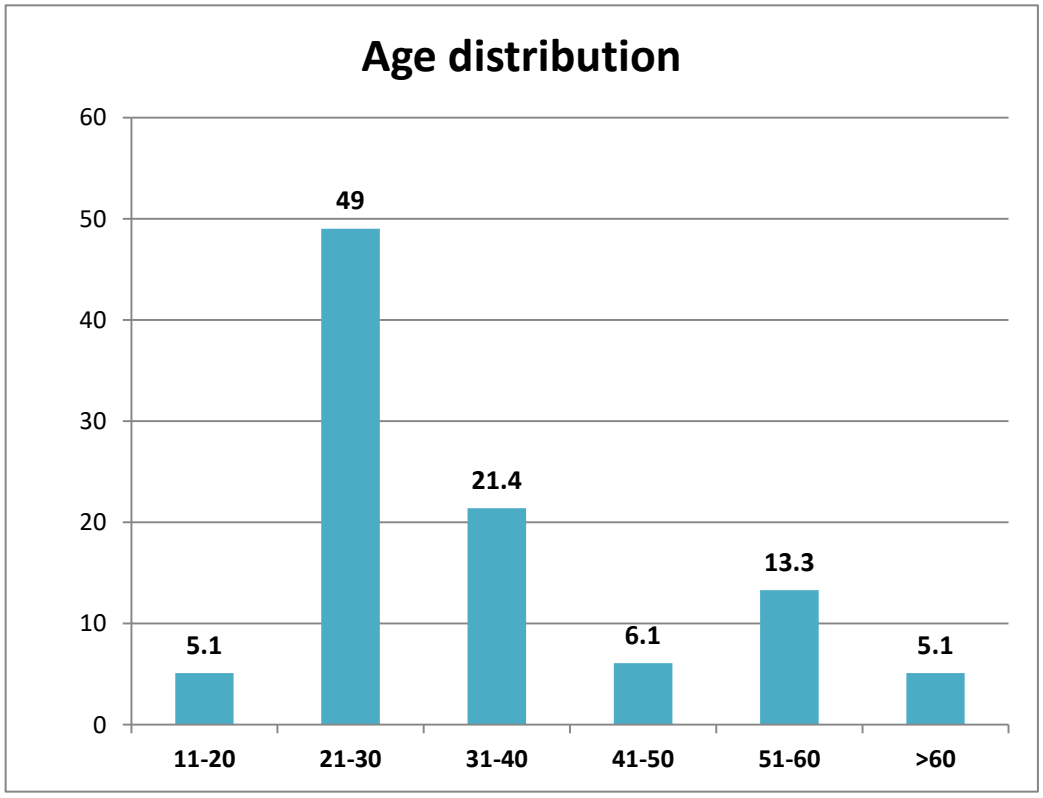
Descriptive statistics will be done for all data and reported in terms of mean values and percentages. Suitable statistical tests of comparison will be done.

Using 2X2 contingency tables, following predictive parameters will be calculated: sensitivity and specificity, positive predictive value (PPV) and negative predictive value (NPV). The data will be analyzed using SPSS version 16 and Microsoft Excel 2007.

1. Age distribution

Mean age of the study participants was 33.8 years and standard deviation was 12.7 years

Age groups	Number	Percentage
11-20	5	5.1
21-30	48	49.0
31-40	21	21.4
41-50	6	6.1
51-60	13	13.3
>60	5	5.1
Total	98	100



AGE

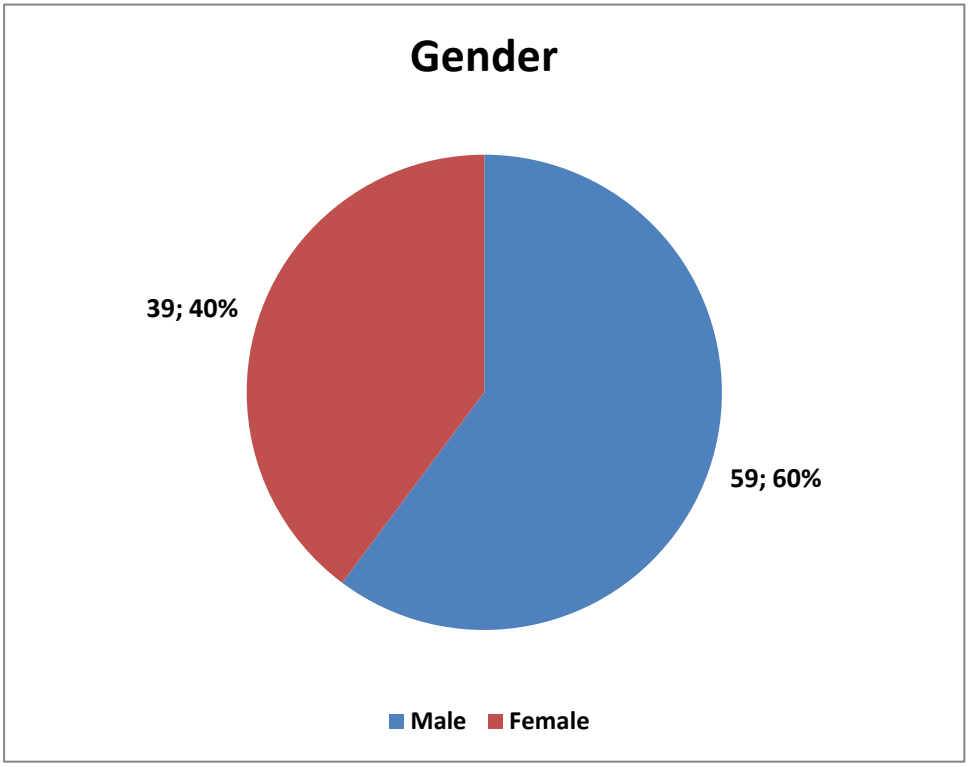
Out of 98 participants many of them from age group 20-30 yrs. The total number of participants in the above age group is 48(49%)

Mean age of study participants are 33.8 years

Standard Deviation is 13.7 years

2. Gender distribution

Gender	Number	Percentage
Male	59	60.2
Female	39	39.8
Total	98	100



GENDER

Out of total study participants,

Number of males are 59 (60.2%),

Number of females are 39 (39.8%).

3. Distribution of BMI and neck circumference among study participants

Parameter	Mean	SD	Min	Max
BMI	25.7	5.2	15.39	49.1
Neck circumference	40.8	4.4	30	47

BODY MASS INDEX (BMI)

Minimum BMI of participant is 15.39

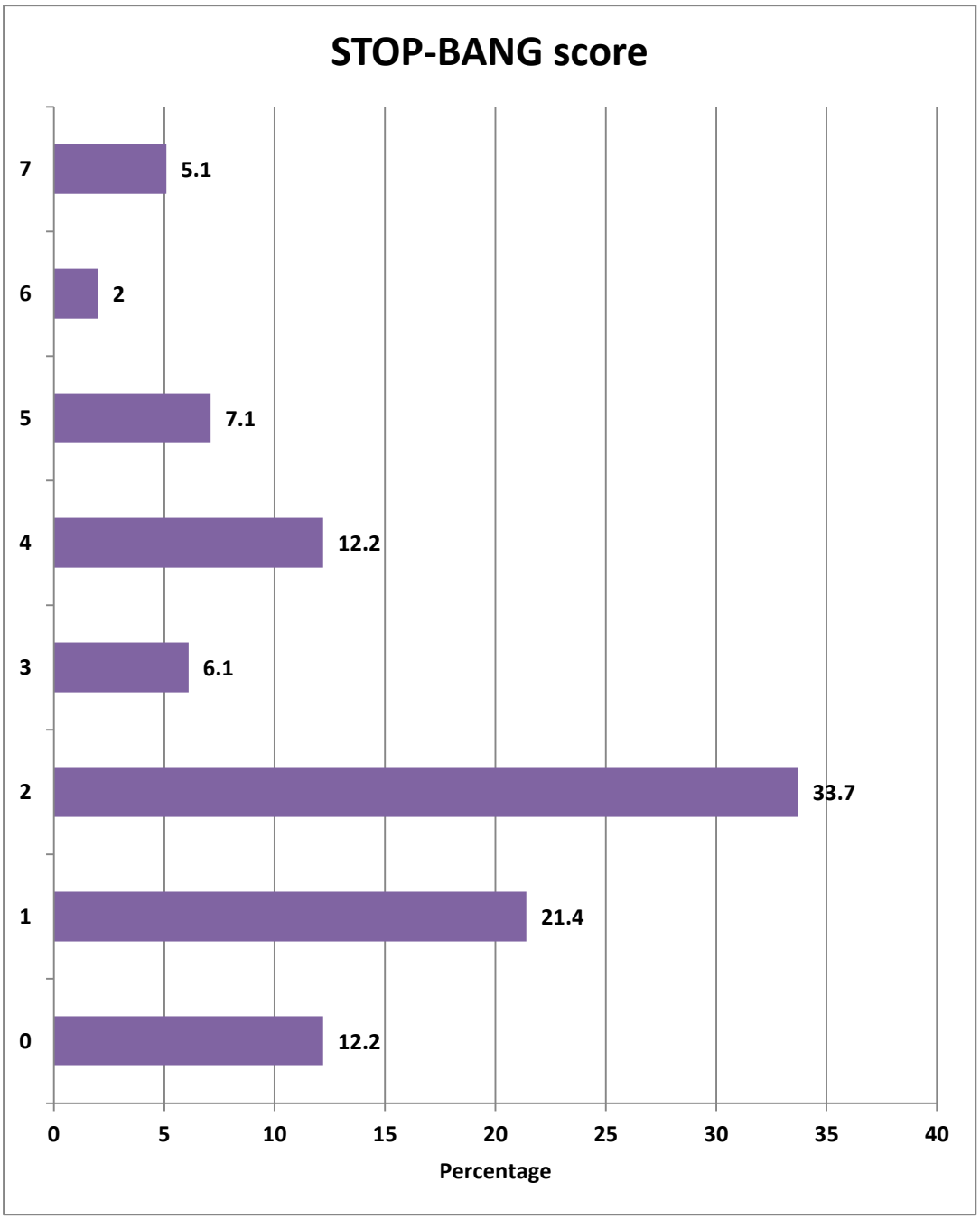
Maximum BMI of participant is 49.1

Mean BMI of participants are 25.7

Standard Deviation is 5.2

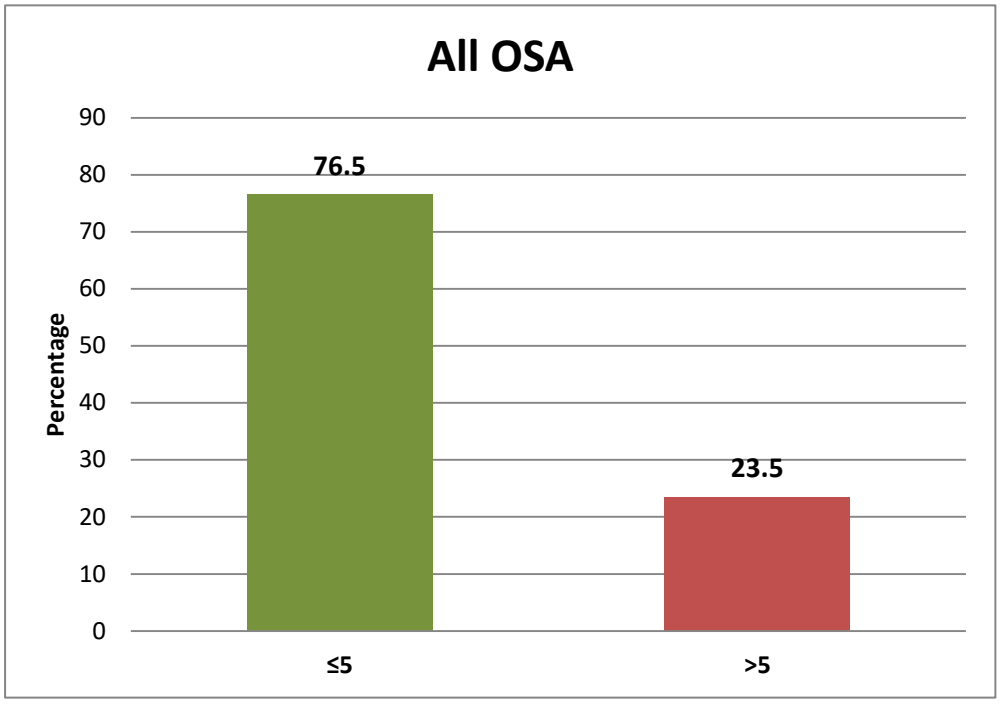
4. STOP-BANG score

STOP-BANG score	Number	Percentage
0	12	12.2
1	21	21.4
2	33	33.7
3	6	6.1
4	12	12.2
5	7	7.1
6	2	2.0
7	5	5.1
Total	98	100


STOP-BANG score
7
5.1
6
2
5
7.1
4
12.2
3
6.1
2
33.7
1
21.4
0
12.2
0
5
10
15
20
25
30
35
40
Percentage

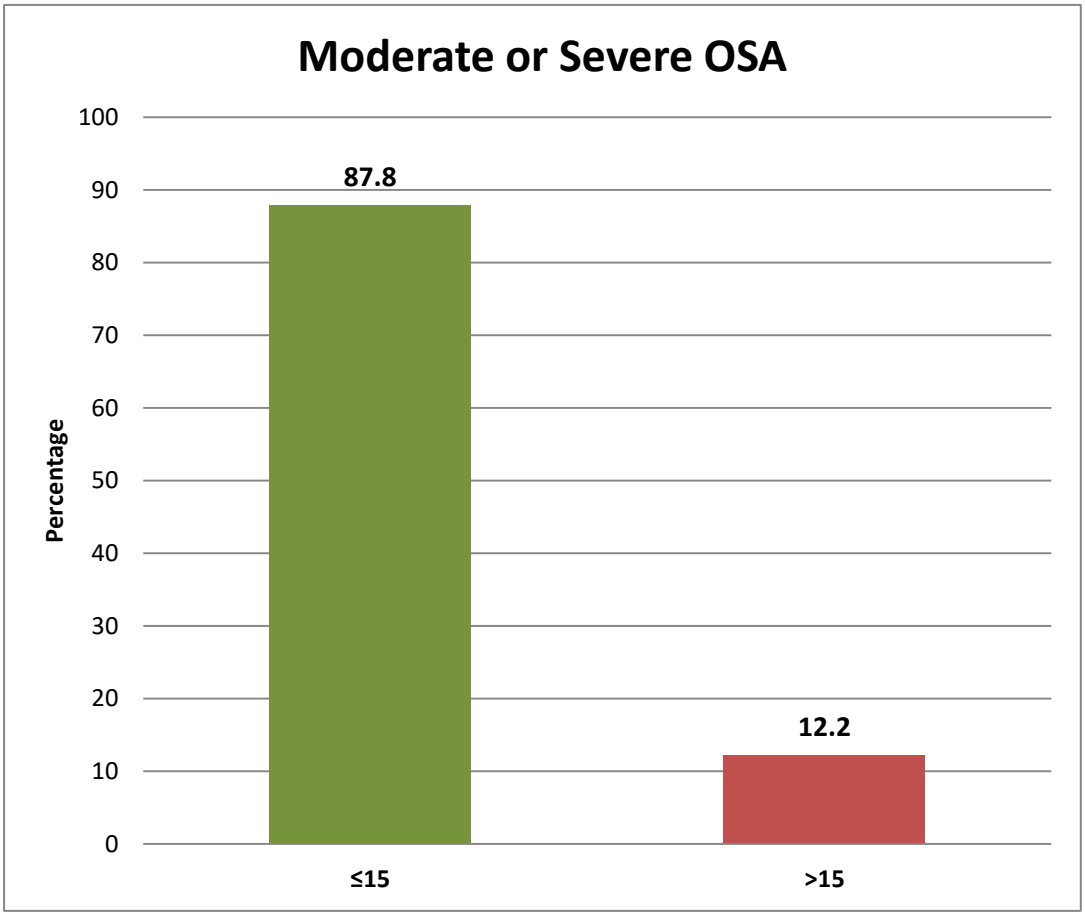
5. OSA (>5)

All OSA	Number	Percentage
≤5	75	76.5
>5	23	23.5
Total	98	100



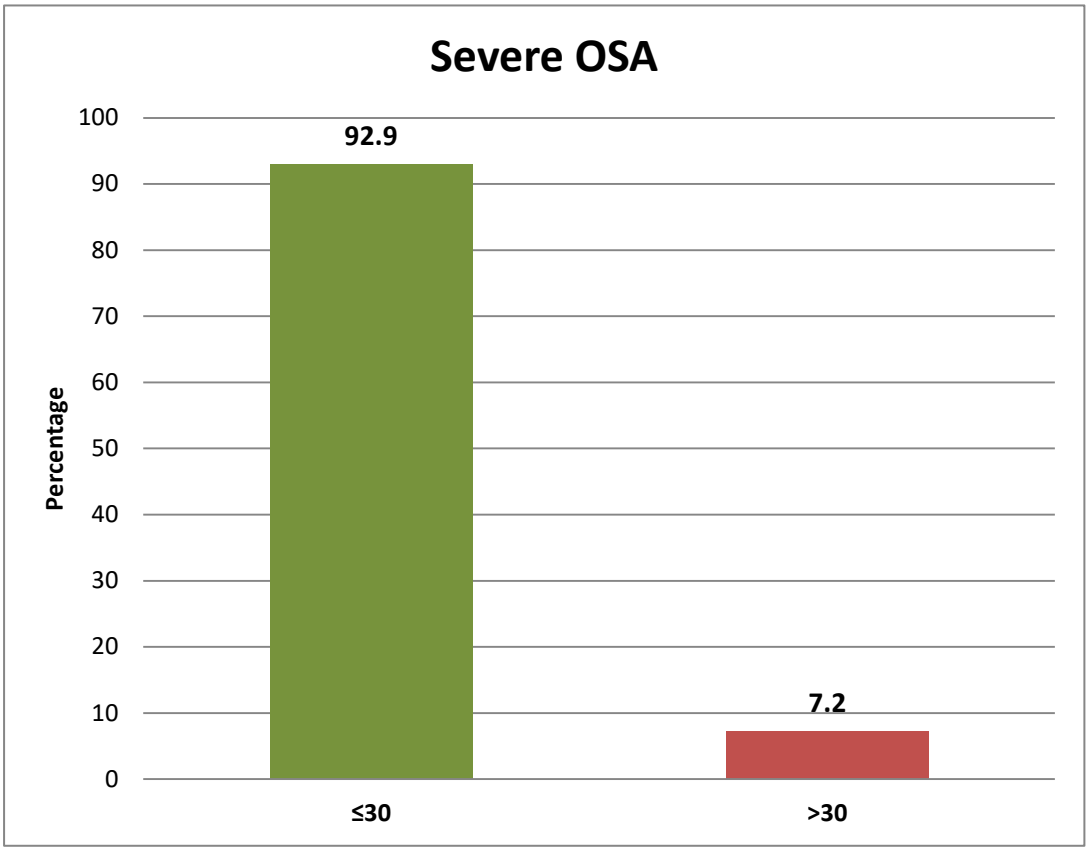
6. Moderate or severe OSA

Moderate or Severe OSA	Number	Percentage
≤15	86	87.8
>15	12	12.2
Total	98	100



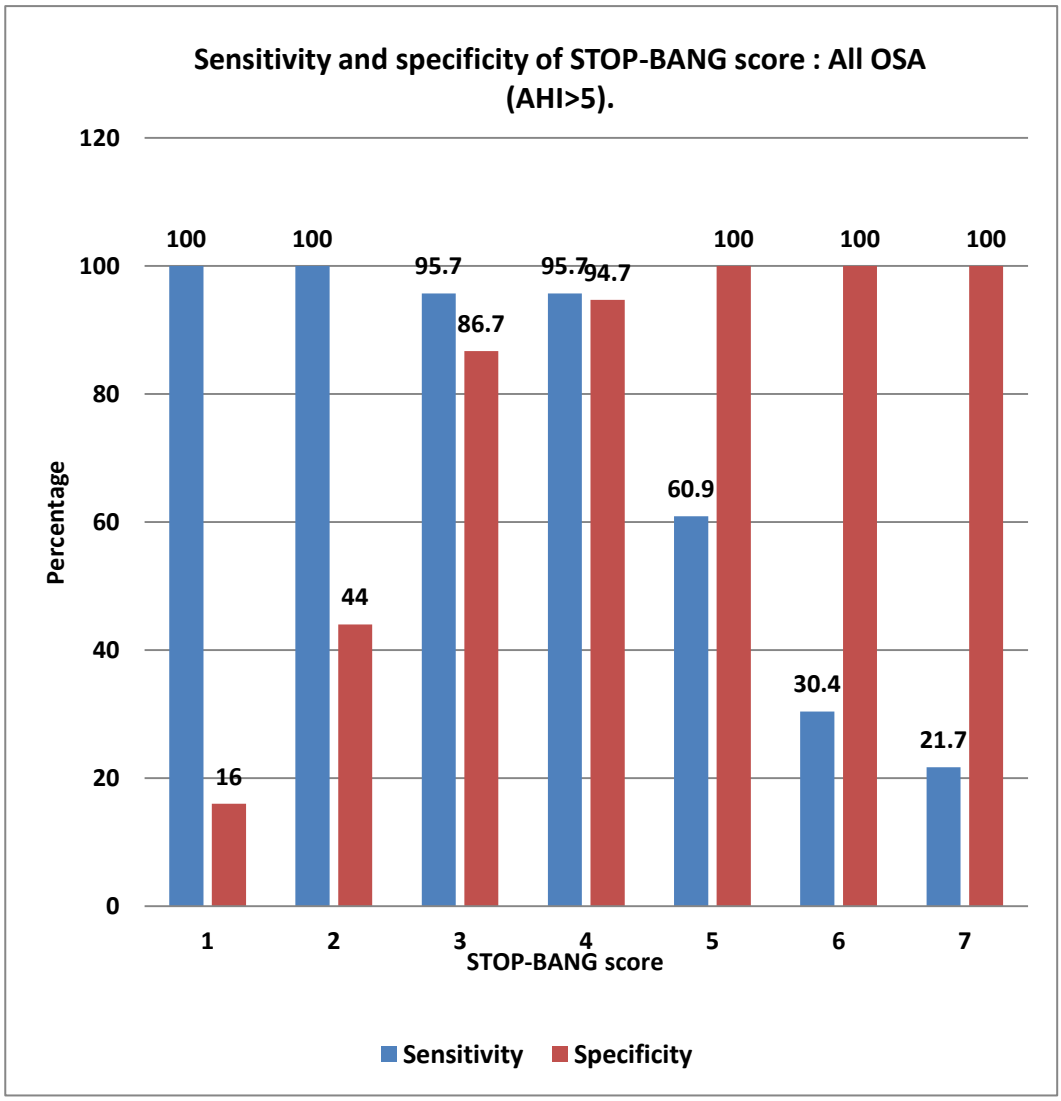
6. Severe OSA

Severe OSA	Number	Percentage
≤30	91	92.9
>30	7	7.2
Total	98	100



7. Sensitivity, specificity, PPV and NPV of STOP-Bang score in determining all OSA (AHI>5).

	Sensitivity		**PPV**	**NPV**
1	100 (86-100)	16 (9-26)	26.7	100
2	100 (86-100)	44 (33-55)	35.4	100
3	95.7 (79-99)	86.7 (77-93)	68.8	98.5
4	95.7 (79-99)	94.7 (87-98)	84.6	98.6
5	60.9 (41-78)	100 (95-100)	100	89.3
6	30.4 (16-51)	100 (95-100)	100	82.4
7	21.7 (10-42)	100 (95-100)	100	80.7


Sensitivity and specificity of STOP-BANG score : All OSA (AHI>5).
120
100
80
60
40
20
0
Percentage
100
16
100
44
95.7
86.7
95.7
94.7
60.9
100
30.4
100
21.7
100
1
2
3
4
5
6
7
STOP-BANG score
Sensitivity
Specificity

RESULTS

For all OSA (AHI>5)

For STOP BANG score of 3 for all OSA (AHI>5) sensitivity is 95.7%and the corresponding NPV is 98.5%

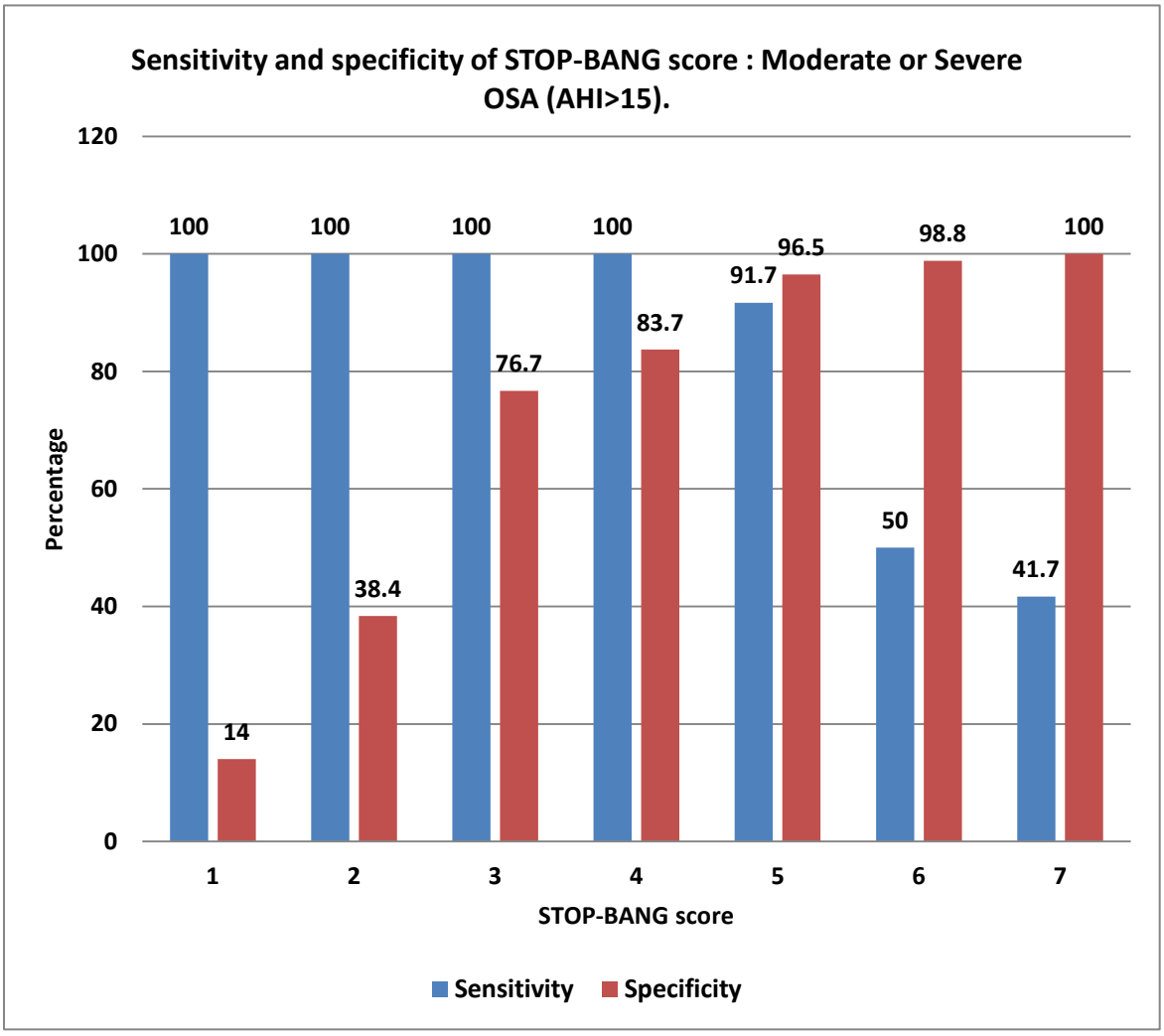
As the STOP BANG score increases from 2 to 3, 4, 5, 6, 7 Specificity increases to 44%, 86.7%, 94.7%, 100%, 100%, and 100% respectively.

As the STOP BANG score increases from 2 to 3, 4, 5, 6, 7 probability of OSA increases to 35.4%, 68.8%, 84.6%, 100%, 100%, and 100% respectively.

As the STOP BANG score increases 2 to 3, 4, 5, 6, 7 ;Negative predictive value show decreasing trend, the corresponding negative predictive values are 98.5, 98.6, 89.3, 82.4, 80.7.

8. Sensitivity, specificity, PPV and NPV of STOP-Bang score in determining moderate or severe OSA (AHI>15).

STOP-BANG score	**Sensitivity**	**Specificity**	**PPV**	**NPV**
1	100 (76-100)	14.0 (8-23)	14.0	100
2	100 (76-100)	38.4 (29-50)	18.5	100
3	100 (76-100)	76.7 (67-84)	37.5	100
4	100 (76-100)	83.7 (75-90)	46.2	100
5	91.7 (65-99)	96.5 (90-99)	78.6	98.8
6	50 (25-75)	98.8 (94-100)	85.7	93.4
7	41.7 (19-68)	100 (96-100)	100	92.5


Sensitivity and specificity of STOP-BANG score : Moderate or Severe OSA (AHI>15).
120
100
80
60
40
20
0
Percentage
100
14
100
38.4
100
76.7
100
83.7
91.7
96.5
50
98.8
41.7
100
1
2
3
4
5
6
7
STOP-BANG score
Sensitivity
Specificity

RESULTS

For Moderate to severe OSA (AHI>15)

For STOP BANG score of 3 for all OSA (AHI>15) sensitivity is 100% and the corresponding NPV is 100%

As the STOP BANG score increases from 2 to 3, 4, 5, 6, 7 Specificity increases to 38.4%, 76.7%, 83.7%, 96.5%, 98.8%, and 100% respectively.

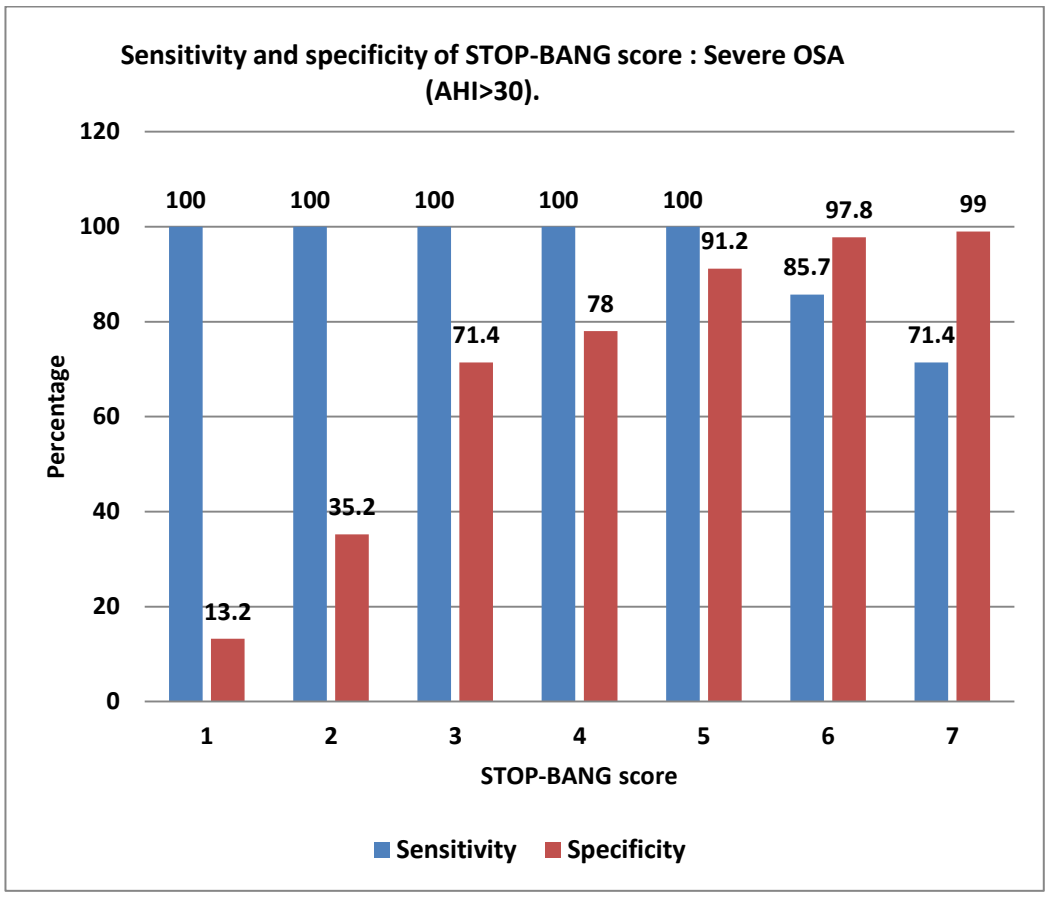
As the STOP BANG score increases from 2 to 3, 4, 5, 6, 7 Probability of OSA increases to 18.5%, 37.5%, 46.2%, 78.6%, 85.7%, and 100% respectively.

As the STOP BANG score increases from 2 to 3, 4, 5, 6, 7; Negative Predictive value show decreasing trends corresponding negative predictive values are 100%

100%, 98.8%, 93.4%, 92.5%.

9. Sensitivity, specificity, PPV and NPV of STOP-Bang score in determining severe OSA (AHI>30).

STOP-Bang score	**Sensitivity**	**Specificity**	**PPV**	**NPV**
1	100 (65-100)	13.2 (8-22)	8.1	100
2	100 (65-100)	35.2 (26-45)	10.6	100
3	100 (65-100)	71.4 (61-80)	21.1	100
4	100 (65-100)	78 (69-85)	25.9	100
5	100 (65-100)	91.2 (84-96)	46.7	100
6	85.7 (49-97)	97.8 (92-99)	75	98.9
7	71.4 (36-92)	99 (94-99.8)	83.3	97.8


Sensitivity and specificity of STOP-BANG score : Severe OSA (AHI>30).
120
100
80
60
40
20
0
Percentage
100
100
100
100
100
85.7
71.4
13.2
35.2
71.4
78
91.2
97.8
99
1
2
3
4
5
6
7
STOP-BANG score
Sensitivity
Specificity

RESULTS

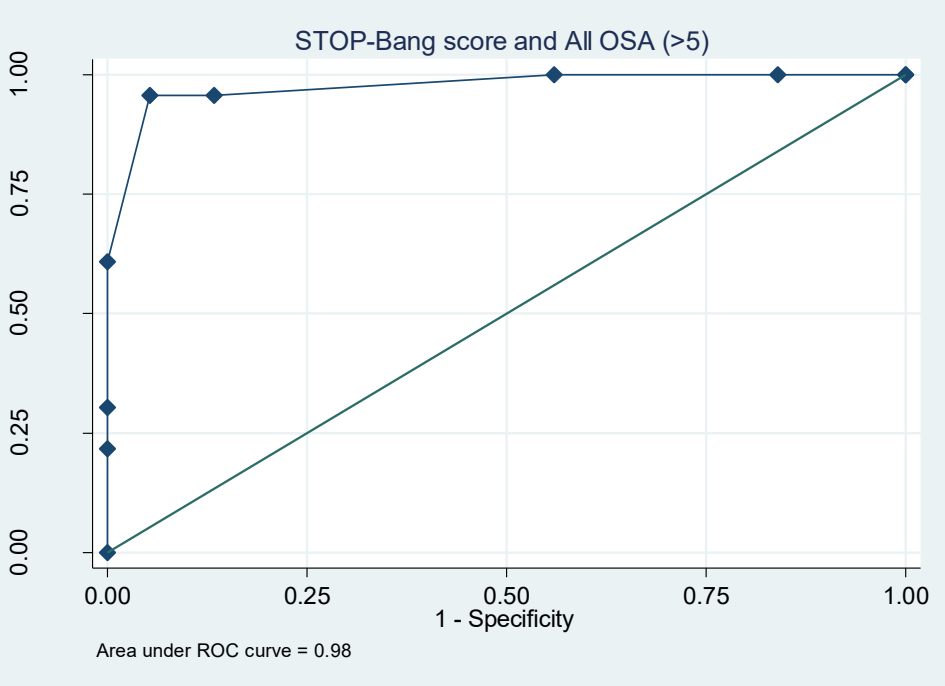
For severe OSA (AHI>30)

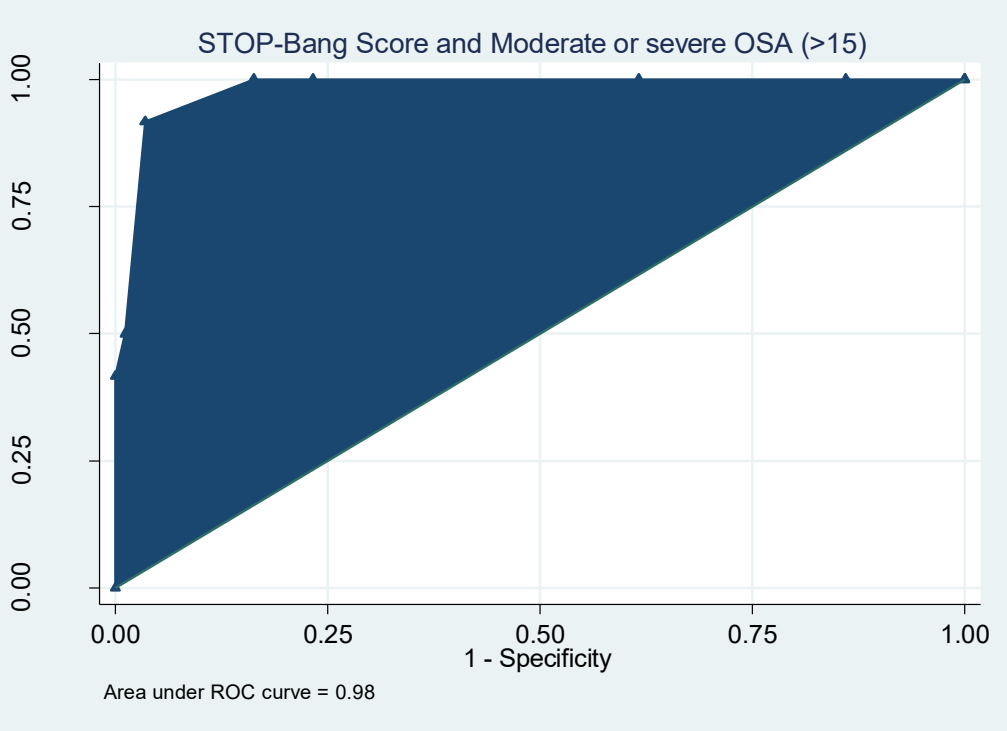
For STOP-BANG score of 3 for severe OSA (AHI>30), sensitivity is 100% and the corresponding NPV is 100%.

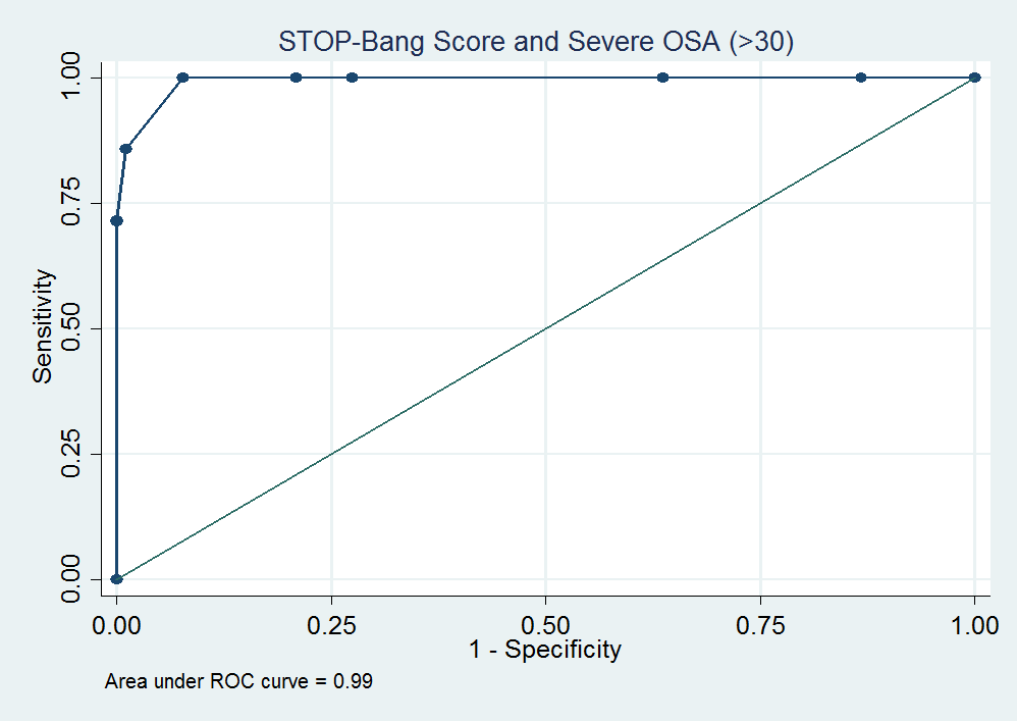
As the STOP BANG score increases from 2 to 3 4, 5, 6, 7; Specificity increases to 35.2%, 71.4%, 78%, 91.2. %, 97.8%, 99% respectively.

As the STOP BANG score increases from 2 to 3, 4, 5, 6, 7 probability of OSA increases to 10.6%, 21.1%, 25.9%, 46.7%, 75%, and 83.3% respectively.

For STOP BANG score increases from 2 to 3, 4, 5, 6, 7 the corresponding Negative predictive values are 100%, 100%, 100%, 98.9%, 97.8%.


STOP-Bang score and All OSA (>5)
0.00
0.25
0.50
0.75
1.00
1 - Specificity
Area under ROC curve = 0.98


STOP-Bang Score and Moderate or severe OSA (>15)
0.00
0.25
0.50
0.75
1.00
1 - Specificity
Area under ROC curve = 0.98



ROC CURVES

The area under ROC curve for all OSA (AHI >5) is 0.98.

The area under ROC Curve for moderate to severe OSA is 0.99.

The area under ROC curve for severe OSA is 0.99.

DISCUSSION

In this study 98,preoperative patients were screened with STOP-BANG Questionnaire for obstructive sleep apnea and confirmed with Polysomnography. Of the 98 participants, 23 participants were diagnosed to have obstructive sleep apnea. In systematic-review and meta-analysis conducted by Nagappa, Liao, Wong, Auckley, and Ramachandran, Memtsoudis, et al, as the STOP-BANG score cut off increased from 2 to ≥ 7 for any OSA with AHI ≥5 Specificity increased from 40% to 98%. Similarly in this study, Specificity shows increasing trends from 44 % to 100 %. In the same systematic-review and meta- analysis, Sensitivity for STOP-BANG 3 for any OSA with AHI ≥ 5 is 84% and sensitivity for STOP-BANG score 7 is 4% . As the systematic-review, this study also shows similar decreasing trend from 95.1% to 21.7% as the STOP-BANG score increased from 3 to 7. The Positive predictive values increases from 75% to 82% as the STOP-BANG score increases from 3 to 7 for any OSA with AHI ≥ 5 in the systematic-review and in this study, probability of OSA increased from 68.8% to 100% respectively.

In systematic-review and meta-analysis conducted by Nagappa, Liao, Wong, Auckley, and Ramachandran, Memtsoudis, et al as the STOP-BANG score cut off increased from 2 to ≥ 7 for moderate to severe OSA with AHI ≥ 15, Specificity increased from 11% to 90 %. Similarly in this study, Specificity shows increasing trends from 76.7% to 100 %. In the same systematic-review and meta-analysis, Sensitivity for STOP-BANG

3 for moderate to severe OSA with AHI ≥ 15 is 90 % and sensitivity for STOP-BANG score 7 is 4% . As the systematic-review, this study also shows similar decreasing trend from 100% to 41.7 % as the STOP-BANG score increased from 3 to 7. In systematic-review and meta-analysis, conducted by Nagappa, Liao, Wong, Auckley, and Ramachandran, Memtsoudis, et al, as the STOP-BANG score cut off increased from 3 to ≥ 7 for severe OSA AHI ≥ 30 Specificity increased from 28 % to 97 %. Similarly in this study Specificity shows increasing trends from 71.4 % to 99 %. In the same systematic-review and meta-analysis, Sensitivity for STOP-BANG 3 for severe OSA with AHI > 30 is 95 % and sensitivity for STOP-BANG score 7 is 6 % . As the systematic-review, this study also shows similar decreasing trend from 100 (65% - 100%) to 71.4 % (36% -92%) as the STOP-BANG score increased from 3 to 7.Because of the high prevalence of undiagnosed and untreated OSA and its associated problems simple and effective OSA screening tool is essential. This way of screening the patients is very important for perioperative team as often there is little time to complete a preoperative assessment of OSA with the standard diagnostic approach. The STOP-BANG Questionnaire can satisfy this need given that it is a short, practical and straight forward test. This questionnaire can be completed within minutes with very high response rates

SUMMARY

Obstructive sleep apnea is the most prevalent of sleep disordered breathing. Obstructive sleep apnea affects 24% of men, 9% of women in the general population. An estimated 82% of men 92% of women with moderate to severe obstructive sleep apnea have not been diagnosed.

In OSA repeated episodes of partial and complete collapse cause a reduction or total cessation of airflow during sleep resulting in oxygen desaturation and arousals from sleep.

OSA is a serious condition that diminishes quality of life and is also associated with many co-morbidities. . The average life span of a patient with untreated OSA is reduce

The Aim of study is to test the performance of STOP-BANG QUESTIONNAIRE for the diagnosis of Obstructive sleep apnea in preoperative patients. The objective of the study is to validate The STOP-BANG QUESTIONNAIRE by using **POLYSOMNOGRAPHY** as a gold standard test.

Methodology - Out of 25-30 new patients coming to preoperative assessment clinic, one participant will be selected by simple random sampling and the participant will be evaluated using STOPBANG Questionnaire containing four subjective and four demographic parameters and the patients are classified based on STOP-BANG score into

0 – 2 Low risk of sleep apnea

3 – 4 Intermediate risk of having sleep apnea

5 – 8 High risk of having sleep apnea

and the same participant will be subjected to Polysomnography and classified based on APNOEA HYPOPNEA INDEX (AHI) into

Normal - AHI <5

MILD - AHI 5-14

Moderate - AHI 15-29

Severe - AHI 30 and above

The Results are the Mean age of study participants are 33.8 years and the Standard Deviation is 13.7 years. The Mean BMI of participants are 25.7 and the Standard Deviation is 5.2.The Mean Neck circumference of participants are 40.8 and the Standard deviation is 4.4.For STOP BANG score of 3 for any OSA (AHI>5), sensitivity is 95.7%.As the STOP BANG score increases from 2 to 7, probability of OSA increases from 35.4% to 100% respectively. For STOP BANG score of 3 for Moderate to Severe OSA (AHI>15), sensitivity is 100%.As the STOP BANG score increases from 2 to 7, probability of OSA increases to 18.5% to 100% respectively. For STOP BANG score of 3 for Severe OSA (AHI>30), sensitivity is 100% .As the STOP BANG score increases from 3 to 7, probability of OSA increases to 21.1% to 83.3% respectively.

CONCLUSION

This study has concluded that the STOP-BANG Questionnaire is a concise, effective and reliable tool for screening Obstructive sleep apnea in preoperative patients. It facilitates efficient allocation of resources in both diagnosing and treating previously unrecognized Obstructive sleep apnea. The probability of moderate to severe Obstructive sleep apnea increases in direct proportion to the STOP-BANG score which makes the Questionnaire an easily used tool for identifying patients at high risk for Obstructive sleep apnea.

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INSTITUTIONAL ETHICS COMMITTEE
GOVT. KILPAUK MEDICAL COLLEGE,
CHENNAI-10
Protocol ID. No. 02/2017 Meeting held on 14.11.2017

The Institutional Ethical Committee of Govt. Kilpauk Medical College, Chennai reviewed and discussed the application for approval **"A STUDY OF VALIDATING STOPBANG QUESTIONNAIRE AS SCREENING TOOL FOR OBSTRUCTIVE SLEEP APNOEA IN PREOPERATIVE PATIENTS"** submitted by Dr.J.PRINCE, Post Graduate in M.D Anaesthesiology, Govt. Kilpauk Medical College, Chennai-10.

The Proposal is **APPROVED.**

The Institutional Ethical Committee expects to be informed about the progress of the study any Adverse Drug Reaction Occurring in the Course of the study any change in the protocol and patient information /informed consent and asks to be provided a copy of the final report.

15.11.2017.

DEAN
Govt. Kilpauk Medical College,
Chennai-10.

14-11-17

ME 1 Sec> Ethical Committee

INFORMED CONSENT FORM

<u>STUDY:</u> "A STUDY VALIDATING STOP-BANG QUESTIONNARE AS SCREENING TOOL FOR OBSTRUCTIVE SLEEP APNOEA IN PREOPERATIVE PATIENTS"

STUDY CENTRE : KILPAUK MEDICAL COLLEGE HOSPITAL

PATIENT'S NAME :

PATIENT'S AGE :

I.P NO :

Patient may check (√) these boxes

- I confirm that I understood the purpose of the procedure for the above study. I have the opportunity to ask question and all my questions and doubts have been answered to my complete satisfaction ☐
- I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving reason, without my legal rights being affected. ☐
- I understand that the ethical committee members and the regulatory authorities will need not my permission to look at my health records, both in respect of the current study and any further research

that may be conducted in relation to it, even if I withdraw from the study I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. ☐

- I agree not to restrict the use of any data or results that arise from the study. I agree to take part in the above study and to comply with the instructions given during the study and faithfully co operate with the study team and to immediately inform the study staff if I suffer from any deterioration in my health or well being or any unexpected or unusual symptoms. ☐ ☐
- I hereby consent to participate in this study.
- I hereby give permission to undergo complete clinical examination and diagnostic tests including hematological, biochemical, radiological tests. ☐

Signature / thumb impression:

Patient's name and address: Place: Date:

Signature of the investigator:

Study investigator's name: Place: Date:

PARTICIPANTS" INFORMATION SHEET

Investigator : Dr.PRINCE J

Name of the participant : : -

Title: **"A STUDY VALIDATING STOPBANG QUESTIONNAIRE AS SCREENING TOOL FOR OBSTRUCTIVE SLEEP APNOEA IN PREOPERATIVE PATIENTS".**

You are invited to take part in this research study. We have got approval from the IEC. You are asked to participate because you satisfy the eligibility criteria.

What is the purpose of this research?

In this study, the accuracy of STOP-BANG Questionnaire in screening patients for obstructive sleep apnoea and evaluation of the relationship between STOP-BANG SCORE and probability of OSA among preoperative patients is determined

BENEFITS:

By identifying patients with OSA in preoperative period, we can anticipate and prevent intra-operative and postoperative respiratory complications.

CONFIDENTIALITY:

Patients who participated in the study and their details will be maintained confidentially and at any cost, those details will not be let out.

RIGHT TO WITHDRAW:

Patients will not be forced to complete the study. At any cost, in such circumstances the treatment will not be compromised.

Signature of the investigator:

Signature/Thumb impression of the participant:

Date:

Signature of the investigator:

Place:

MASTER CHART

SERIAL NO	NAME	AGE	IP NUMBER	SEX	HEIGHT	WEIGHT	BMI	NECK CIRCUMFERENCE (CMs)	STOP BANG SCORE	APNOEA HYPOPNEA INDEX	LEAST SPO2
1	SARADHA	24	74975	F	161	52	20.06	32	1	2	98
2	SURESH	28	80001	M	165	68	24.68	43	2	2.3	99
3	ARAVIND	24	80300	M	170	95	32.87	45	4	5.9	91
4	HEMALATHA	24	73245	F	164	98	36.4	46	4	14.1	83
5	MAHESH	42	75632	M	171	70	23.4	42	1	3	95
6	MADHESHWARAN	40	88026	m	172	94	31.8	43	2	1	80
7	SHANMUGARA	29	88587	M	167	55	19.72	39	1	1	85
8	MAANIAM	24	66526	M	171	48	15.39	34	1	2	85
9	MADHAN LAL	44	75623	M	153	115	49.1	46	7	65.7	71
10	RANI	17	56234	F	155	45	18.73	30	0	1	97
11	MANIMEGALAI	23	64321	F	166	69	25.04	43	2	2	95
12	ROSHAN	24	59057	M	175	85	27.76	45	2	1	99
13	MASILA	30	64571	M	172	89	30.08	45	2	2	94
14	MURUGESAN	27	72453	M	166	71	25.77	44	2	1	98
15	HARINI	21	54812	F	159	50	19.78	33	0	1	99
16	BEGUM	25	71271	F	165	65	23.88	40	2	3	91
17	NAIIATHAMBI	63	81874	M	170	65	22.49	41	2	1	96
18	MANGAYARKARAS	53	535	F	166	73	26.5	42	2	2.1	72
19	MEENA	24	99526	F	152	50	21.64	39	1	2	99
20	RAMPRAKASH	32	1256	M	170	95	32.87	46	3	3	92
21	SUNDARI	33	104	F	149	65	29.28	43	2	2.2	98
22	UDHAY	52	91285	M	170	75	25.95	44	3	1.5	99
23	RENGANATHAN	39	88534	M	167	65	23.31	43	4	3	97
24	CHITRA	23	1509	F	158	50	20.03	36	1	1.2	98
25	RADHAA	21	1642	F	155	52	21.64	33	0	1	99
26	ANTONY	40	1023	M	165	120	44.1	46	7	69.7	34
27	MURAII	25	89563	M	170	53	18.34	40	2	1.8	95
28	SANKAR	23	1923	M	165	71	26.08	41	2	1	97
29	SREEDHAR	30	1432	M	164	67	24.9	41	2	5.4	88
30	JABEER	34	87651	M	168	70	24.8	43	3	4.1	96
31	MAIAR	23	1756	F	154	56	23.61	36	1	1.8	96
32	ABINAYA	25	2014	F	160	50	19.53	33	0	1	98
33	SUMAN	33	72	M	168	78	26.57	41	2	2	95
34	DHI THANGAPALA	31	75071	M	172	98	33.1	45	6	32.1	81
35	BALAGI	30	2078	M	169	85	29.76	43	5	17	81
36	MOOSA	41	568	M	176	80	25.83	43	4	3.8	90
37	DEVI	27	2389	F	160	54	21.09	35	1	2.1	95
38	ELANGO	21	5091	M	174	88	29.07	42	1	2.9	97
39	INBARAJ	25	3529	M	167	61	21.87	43	2	3.7	95
40	SELVI	19	1081	F	160	48	18.75	32	0	1	98
41	SATHYA	41	539	M	169	96	33.6	45	6	11	84
42	SUBHASHINI	26	709	F	144	60	28.9	42	5	27.4	80
43	REVATHY	24	30781	F	160	55	21.48	37	1	2.5	95
44	YUSUF	21	190	M	166	67	24.31	41	1	3.2	96
45	VENKATESH	23	901	M	178	88	27.77	43	2	2.9	92
46	ROSEBEL	31	2590	F	160	49	19.14	35	0	1	98
47	KANNAN	28	4076	M	168	55	19.49	41	1	1.3	99
48	MENAKA	21	80567	F	161	62	23.92	35	1	1.3	98
49	SHANKAR	23	776	M	175	83	27.1	43	2	4.8	87
50	WALTER	40	3976	M	160	72	27.4	45	4	8.1	97
51	SUGANYA	26	251	F	154	55	23.19	32	0	1	99
52	JEYARAJ	23	312	M	167	58	20.8	42	1	1.2	98
53	VINEETH	58	421	M	165	69	25.34	43	4	2.5	93
54	ASHA	65	495	F	152	75	32.4	42	4	11	82
55	MARY	21	32	F	156	56	23.01	35	0	1.9	97
56	VIJAYKUMAR	39	3489	M	168	72	25.5	43	5	12.9	79
57	VINOTHKUMAR	30	2109	M	162	100	38.1	47	7	77.8	52
58	DHANASEKARAN	29	2674	M	168	88	31.18	43	3	4.1	90
59	KARUNA	45	2	M	175	95	31.02	45	3	2	88
60	LAKSHMI	31	3902	F	165	78	28.65	41	2	1	95
61	SAIRA BANU	33	4321	M	158	67	26.8	42	4	5.7	81
62	SURESH	28	5021	M	169	72	25.21	41	1	2.1	99
63	MOHANA	52	99030	F	146	58	27.2	43	5	11.9	89
64	IBRAHIM	26	4803	M	167	78	27.97	44	2	2.7	97
65	VENILLA	62	5804	F	158	55	22.03	35	2	2.2	96
66	JEYASHREE	45	6012	F	160	60	23.44	34	1	1	99
67	BHUVANA	28	712	F	168	65	23.03	38	0	1	99

68	MANO	33	5607	M	171	76	25.99	43	2	1	89
69	CHARUMATHI	52	6905	F	160	55	21.48	33	2	1.7	93
70	ISAAC	61	9012	M	175	68	22.2	43	3	1.9	96
71	VASUKI	51	7591	F	155	58	24.14	36	2	2	97
72	DHIVYA	23	6741	F	160	61	23.83	33	0	1	98
73	THANGARAJ	32	7149	M	175	96	31.35	46	2	1	99
74	PRABHU	38	6958	M	171	80	27.36	44	2	1.8	98
75	RAVIKUMAR	59	8262	M	170	70	24.2	45	7	35.6	80
76	HARIDAS	26	7698	M	178	70	22.1	44	5	16.5	87
77	THILAGA	33	5190	F	163	56	21.08	35	1	1.6	98
78	DAS	38	4804	M	162	70	26.67	43	2	3	98
79	KAREEM	26	4704	M	169	74	25.91	44	2	1	99
80	SUNIL	51	6056	M	167	65	23.31	42	2	1	95
81	RAMESH	54	6709	M	162	72	27.4	45	5	27.4	63
82	KUMARI	51	7053	F	160	60	25.6	41	4	18.8	81
83	ELAVELAN	28	5055	M	173	79	26.4	43	2	1.8	98
84	NANDHINI	56	7906	F	159	60	23.73	35	1	1.2	96
85	SEKAR	29	6704	M	170	83	28.72	44	2	1.9	98
86	MUNISAMY	59	5111	M	165	65	23.88	43	4	3	96
87	SANTHOSH	31	7933	M	161	79	27	44	4	6.2	89
88	ARJUN	27	6896	M	176	85	27.44	45	2	2.7	96
89	GOWRI	18	9580	F	162	60	22.86	36	0	1	98
90	MANISHA	30	10008	F	156	55	22.6	35	1	1	99
91	DAHAGANI	67	5078	M	166	70	27.3	45	7	57.2	77
92	AARTHI	39	7956	F	160	50	19.53	33	0	1	99
93	GANESH	21	12061	M	168	76	26.93	43	2	1	97
94	BASHEER	17	3560	M	173	88	28.09	45	2	1	99
95	MANJULA	33	11089	F	165	70	25.71	41	1	1	93
96	RADHAKRISHNAN	54	12360	M	165	68	25	43	5	60.2	69
97	VIJAY	19	6011	M	162	85	32.39	44	4	7.2	95
98	SARIGA BEGUM	26	9906	F	160	49	19.14	32	1	1	95
99											
100											